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Collective Review

CERVICAL TRACTION, WITH EVALUATION OF METHODS, AND TREATMENT OF COMPLICATIONS

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THE SURGEON who is suddenly confronted with an acute fracture-dislocation of the cervical spine does not always have the references on cervical traction readily available so that he may examine them and select the proper method of traction to fit the patient. Consequently, a review of the methods used for the application of cervical traction in the treatment of spine and spinal cord injuries is desirable in order to evaluate each type and consider its benefits and complications.

CERVICAL TRACTION FOR ACUTE CERVICAL SPINE TRAUMA

The origin of the use of cervical traction has not been definitely established. Reference has been made to Hippocrates' (23) method of reduction of dislocations of the spine, but this was not accomplished by traction but by "succussion." The latter method consisted of strapping the patient to a padded ladder, hoisting the head or foot of the ladder by means of a rope and pulley attached to the gable of a house, and then permitting the contrivance to drop upon the pavement. No doubt compression fractures of the vertebrae resulted, regardless of whether reduction of the fracture-dislocation of the vertebrae was accomplished.

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In 1275 Gulielmus de Saliceto (20) published his book "Cyrurgie," and in it described manual traction on the extended head for the reduction of cervical vertebral dislocation, followed by immobilization in braces. Ambrose Paré (30) in the sixteenth century reduced cervical dislocations by manipulation of the head and neck against counter traction.

Halter traction. It remained for Glisson (1650) (17, 18) to introduce the use of the sling for overcoming deformities of the spine due to rickets. Years later it was really the Glisson sling which was used by Sayre (1877) (33) in his overhead suspension technique for reducing spinal deformity.

In 1929, Alfred Taylor (37) described his classical manipulation procedure. Although Taylor's article has many excellent suggestions on treatment, the manipulation portion is mentioned here only for completeness' sake and to condemn it. Manipulation of the spine should not be done unless it is performed at the time of open reduction of a fracture-dislocation in order that the relationship of displaced bone to the spinal cord and nerve roots may be clearly

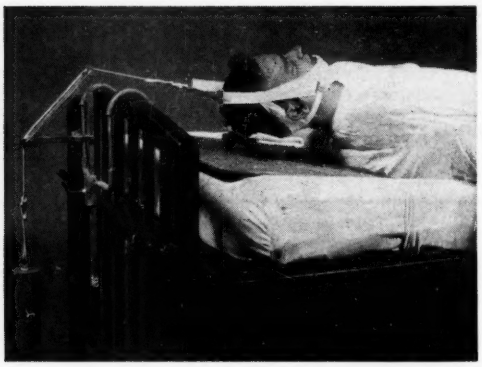

FIG. 1. Halter traction combined with the use of a three-quarter length mattress as shown is satisfactory for temporary supine traction. Note the presence of the ball-bearing platform head rest that enables support of the head and yet permits some movement. The pull must be exerted in the plane of the cervical spine. A strip of spongy foam material applied directly to the skin will prevent pressure sores. The ears must be free of any traction force.

visualized. The Taylor method is of interest because it represents the era in which cervical slings were employed to exert traction and accomplish reduction. These slings were not unlike the cervical halters which are used at the present time to apply traction as a temporary measure during the interval of transportation from the scene of an accident to the hospital (FIG. 1). Lewin (27) described a simple sling which is quite effective. The sling is made of heavy muslin roller bandage about 48 inches long and 6 inches wide. A linear slit about 10 inches long is made through the middle. When this is slipped on the head, one band is applied under the chin and the other under the occiput (FIG. 2). Brunthaler (1921) (7) and Blasdel (1952) (6) used a cervical halter apparatus in combination with multiple pulleys to enable the patient to shift from a supine to a sitting position while still maintaining the correct plane of traction.

In general, the halter apparatus is unpopular for prolonged use both with the patient and the surgeon. It is impossible to keep continued halter traction sufficient to accomplish reduction of a cervical fracture-dislocation without the development of severe trismus of the masseter muscles, which results in difficulty with mastication and the formation of mandibular decubitus ulcers. The use of a foam cushion applied directly to the skin over the chin decreases the irritation of the skin from rubbing and pressure of the sling.

Recently, it must be added, the author had a tragic occurrence while using the halter apparatus, for an irrational patient accidentally hanged himself.

Combination cervical halter traction and plaster body cast. Bisgard (4) stated that in order to immobilize fractures of the cervical spine, fixation must include the articulation of this portion of the spine with the occiput and the thoracic cage. To accomplish this, two pieces of canvas tape, with buckles attached, were incorporated in a Minerva type of plaster jacket so that the free ends of the tape could be secured to the framework at the head of the bed. The head of the bed was then elevated. Traction was obtained by the patient's own body weight, but care had to be taken that the plaster below the axillae was widely cut out. This method enabled simulataneous traction and complete immobilization of the spine.

Crutchfield tong traction. The greatest single advance in the treatment of cervical spinal cord injuries was the development of cervical skeletal traction. This was instituted by Crutchfield (1933) (10, 11, 12) when he first used a set of cervical skeletal traction tongs which now bears his name. McKenzie (1935) (28) and Gallie (1937) (16) used ice-tongs for the same purpose, but these, although effective, proved to be much more unwieldy.

Crutchfield tongs have been employed with considerable success since their introduction. Their insertion is quite readily accomplished.

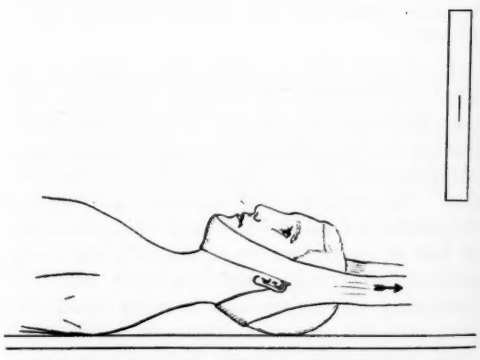

FIG. 2. A simple emergency sling made of a strip of heavy muslin roller bandage with a linear split through the middle. (Courtesy Lewin, P. *Am. J. Surg.*, 1930, 8: 434.)

FIG. 3.

FIG. 4.

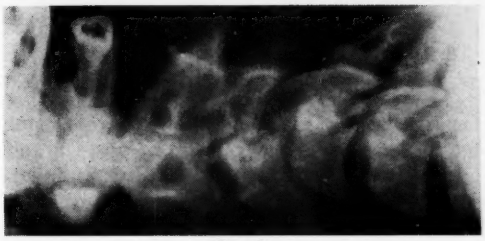

FIG. 5.

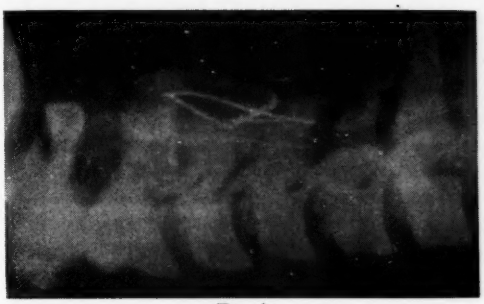

FIG. 6.

FIGS. 3, 4 and 5. Case 1. Serial views of an unsuccessful attempt to unlock the overriding facets in a fracture-dislocation of C3 vertebral body on C4 by increasing the amount of traction.

FIG. 3. June 18, 1954. Roentgenogram after initial injury. A weight of 20 pounds was added to the traction apparatus.

FIG. 4. June 24, 1954. Four days after traction weight had been increased to 40 pounds.

FIG. 5. June 30, 1954. A total weight of 50 pounds was applied to the traction apparatus.

FIG. 6. Case 1. July 6, 1954. Still no reduction of the fracture-dislocation even after 50 pounds of weight were used for a week. Note the marked and dangerous distraction of the vertebrae.

If there is any question about the thickness of the inner and outer table of the skull, a roentgenogram should be taken. A strip of hair is shaved across the vertex of the skull on a plane with the ears. The scalp is prepared, the Crutchfield tongs are held above the head so that they are carefully centered, and then a vertical incision is scratched at the site where the tongs touch the scalp bilaterally. Under local infiltration anesthesia the incisions are carried down through the scalp and pericranium. The pericranium must be carefully freed from the skull to permit drill holes to be made. The latter are made with the Crutchfield drill, which enters the outer table and diploë, and is prevented from penetrating the inner table by a flange approximately 5 millimeters from the tip. Care should be taken to drill the skull at the same angle that the points of the Crutchfield tongs will assume when they are applied to the drill holes. This will enable the tongs to be fastened securely. After being fitted into place the thumb screw is tightened, which locks the tongs, and then a second thumb screw is closed to prevent slippage. A piano wire is applied, run over a pulley, and the desired amount of weight is added.

It is advisable to add a generous amount of weight immediately. In this clinic 35 pounds are added as soon as the tongs are inserted in order to accomplish early reduction of the dislocation before spasm of the muscles makes realignment more difficult. Roentgenograms may be taken at intervals of 12 to 24 hours to see whether reduction has occurred. If the latter is achieved then the weight may be reduced to 15 or 20 pounds to maintain the proper position.

If the interarticular facets are locked, one should wait for 3 or 4 days, and if there is no reduction of the dislocation, then open operation should be performed. Closed manipulation of the cervical spine, as has been indicated previously, is an extremely dangerous maneuver and should be avoided.

A roentgenogram of a C3 vertebral body fracture-dislocation on C4 vertebral body is shown (FIG. 3). Vinke tongs were inserted and 20 pounds of weight applied for traction. Repeated lumbar punctures revealed no cerebrospinal fluid block on compression test of the jugular veins. Serial roentgenograms following the progressive increase in weights showed no reduction of the fracture-dislocation because of the overriding facets, in spite of as much as 50 pounds of weight having been applied for one week (FIGS. 4, 5, and 6). Finally, cervical spinal fusion was performed. The patient's neurological status was normal at the time of his discharge.

There were two major errors in this management. First, there was insufficient weight added at the very beginning of the treatment. The maximum weight of 35 pounds should have been applied immediately, instead of only 20 pounds with a later increase of 10 pounds. The time lag permitted the muscles and ligaments to develop spasm, so that additional weight overcame the deformity with difficulty, if at all. Secondly, and more important, was the fact that as many as 50 pounds of traction were used for more than a week. This was at least 15 pounds above a safe maximum. *There is some danger of torsion or distraction of the cord itself if too much weight is added.*

Overriding facets with improper alignment are therefore an indication for operation in order to prevent a chronic bulge of a partially dislocated body or disc inserted posteriorly into the cervical spinal canal, for the latter may eventually develop callus and cause anterior cervical spinal cord compression.

By changing the position of the Crutchfield tongs, either anteriorly or posteriorly to the plane of the ears, the patient's neck may be either flexed or hyperextended, depending upon the insertion site of the tongs.

There have been unsatisfactory features in the use of this type of tongs. The ability to maintain them in position in the skull depends primarily on the constricting stress of the tongs as they cut into the skull; hence they must be tightened every few days. They are also pointed and tend to penetrate not only the bone but even the dura and brain after they have been periodically tightened. Crutchfield (1954) (13) indicated his tongs could be improved upon and substituted thickened points which were less likely to penetrate the skull. Blackburn (1938) (5) and Raney (1948) (32) have also modified the Crutchfield tongs along similar lines.

Vinke skull tractor (38). This type of skeletal traction was designed to avoid these pitfalls. These tongs may be fitted to the scalp and skull by tightening them gently in place to mark the projected sites of insertion. A needle for the infiltration of local anesthesia may be introduced through the guide bushings of the tongs, and the scalp may be incised with a fine pointed scalpel. The pericranium must be freed from the skull. The guide bushings are then slipped through the scalp incisions down to the skull, and the locking knob at the top of the tongs is tightened firmly by the spanner wrench. The drill holes are made with the special Vinke drills supported in the Hudson drill brace. Penetration is prevented by a drill stop or flange on the drill. A special Vinke gouge which bears an undercutting blade is introduced directly to the hilt, and as the instrument is rotated the undercutting blade is gradually turned a notch outward on each rotation. This results in a groove cut into the diploë between the outer and inner tables of the skull. The undercutting blade of the gouge is dropped back into its bed, the gouge is removed, and the locking units are inserted through the guide bushings. The central portions of the locking units are rotated 180 degrees out of phase, so that the eccentric flange portions of the units lock in the groove which was constructed by the gouge. A knurled locking disc is then rotated one half a revolution until a centralizer ball snaps into a locked position. This enables the Vinke tongs to be solidly maintained. There is no problem of subsequent tightening of the apparatus to retain its position. The disadvantage of the Vinke apparatus is the numerous small parts which may be readily mislaid, whereas the Crutchfield tongs remain as a single piece of equipment.

A word of caution concerning the insertion of the Vinke tongs is indicated. When the Vinke drill holes are made the surgeon must be sure that the drill point has penetrated completely to the depth of its protecting flange. If this is not done, a piece of the outer table of the skull may be cut out when the gouge is inserted and its

FIG. 7.

FIG. 7. Roentgenogram showing penetration of Crutchfield tongs through both tables of the skull into the brain. (This may also occur with the Vinke type tongs as illustrated in Case 2.)

FIG. 8. Case 2. Skull defect in left temporoparietal region after the osteomyelitic bone was removed.

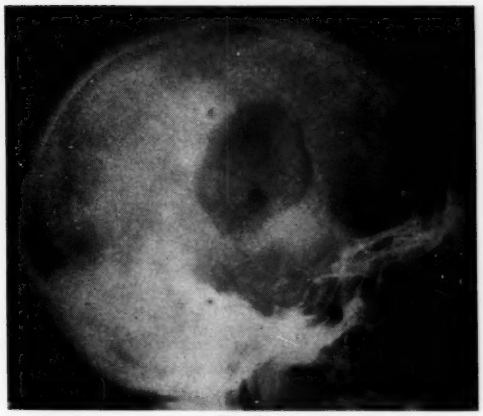

FIG. 8.

undercutting blade is rotated, and thus there is no shelf of the outer table beneath which the eccentric flanges of the locking units can hold.

Fulcher (15) had suggested a horseshoe type of traction apparatus attached to the skull by pins. This, however, has not been constructed commercially or widely used, and, like the Vinke apparatus, has many parts which may be readily lost.

Regardless of the care used in skeletal traction, whether it is of the Crutchfield or Vinke type, the tongs will occasionally penetrate the cranium and brain (FIG. 7). A failure to recognize this may be disastrous. It may occur at any time, but most frequently is observed after 5 to 8 weeks, when some avascular necrosis of the bone develops. Very shortly, infection follows and by the time roentgenographic evidence of osteomyelitis of the skull is observed, the infection is far advanced. There may be associated epidural abscess, meningitis, or brain abscess. When these complications have occurred the author's treatments with massive chemotherapy, excision of all necrotic bone, dura, and abscess, and closure of the wound have resulted in dismal failure. It was not until the dural graft technique was used, similar to that employed for chronic infections secondary to penetrating wounds of the brain (39), that success was achieved.

The skull roentgenogram of a patient who developed a secondary wound infection with osteomyelitis is shown (FIG. 8). Frank pus was cultured from the wound. A dural defect was noted and, from this, clear cerebrospinal fluid poured out. A defect of 0.5 centimeter was seen in the brain, but no evidence of a well defined brain abscess. The bone, dura, and brain were removed with suction, and a fascia lata graft was sutured into place. A vaseline gauze pack was inserted to seal the wound from the air. About 12 to 18 days later a pack such as this may be removed. The graft will be found to be sloughing in the center and "taking" about the periphery. The cerebrospinal fluid has been sealed off and granulations are forming over the edge of the bone and the remaining portion of the graft. The wound may be packed open and irrigated with antibiotics. After adequate cleansing a split-thickness graft may be applied and pressure exerted by a stent of sterile dental compound. Any bone grafting or scalp closure should be deferred from 6 months to a year. The method seems long and tedious but has worked effectively for the author in many cases.

Fishhook traction. In 1933, Neubeiser (29) first introduced the use of fishhooks, which he inserted bilaterally under the zygomatic arch. Wires were led from the hooks to a spreader bar to which weights could be applied. He reported one case. Selmo (1939) (34) reported the use of a blunt type of metal hook which worked effectively. Peyton, Hall, and French (1944) (31) employed No. 5 stainless steel fishhooks in zygomatic traction on 11 patients. The barbs of the hook had been removed and were inserted at a point one inch in front of the external auditory meatus bilaterally (FIG. 9). Wires were then led up to a wooden spreader bar to which weight could be

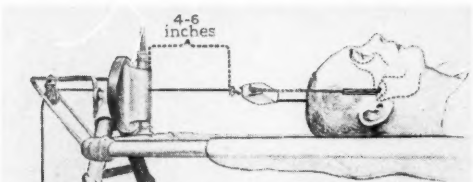

FIG. 9. Diagram illustrating site of insertion of fishhooks as suggested by Selmo (13) and Peyton, Hall and French (12).

applied. Although each hook tested 20 pounds of weight, a maximum load of 15 pounds was applied to accomplish reduction. Batchelor (1946) (3) advocated the use of metal hooks attached to a metal cross bar. The principle is very similar to that of the method originally described by Neubeiser.

If the fishhook method is employed two precautions should be observed. First, at the time of insertion of the hooks the skin should be drawn well downward from the zygomatic arch so that after the hooks are inserted the skin will return to its normal position when traction is applied. Second, the base of the fishhooks and attached wires should be covered with rubber or polyethylene tubing to protect against the development of pressure sores over the face. The author has found that with this type of traction the neck is drawn slightly into hyperextension and this must be corrected by placing a low support under the head (FIG. 10).

Zygomaticomalar arch traction for the cervical spine. Soustelle (1951) (36) made two small incisions under local anesthesia and applied hooks to the lower edge of the zygomaticomalar arch. These were adjustable and oriented in longitudinal and vertical planes on graduated sliders. The mounting was maintained solidly by a sponge rubber cushion fastened firmly over the cranium. Weight may be applied to the adjustable hook which may be moved back and forth on the horizontal rod. The canvas band placed around the occiput prevents the apparatus from drawing the head backward into hyperextension.

The advantage of this method of traction over the fishhook type is that the attachment of the hooks is to the malar bone and not to the zygomatic portion of the arch which is weaker. In the latter position there is insertion of the hook through the sheath of the masseter muscle which may result in traumatic myositis. The zygomaticomalar traction site was therefore regarded as a preferable one.

Steelwire cranial burr hole traction. There is still another method of skeletal traction which was first suggested by Hoen (1936) (24), which is less appealing to the surgeon interested in gadgets. However, it is extremely valuable in treatment and avoids the pitfalls of penetration of the dura and the brain. Small incisions may be made bilaterally in the scalp about 2 centimeters paramedian to the longitudinal sinus, one just anterior to the coronal suture, and another at a site about an inch posterior to the plane of the ear. This places the ipsilateral holes about 5 centimeters apart. Burr holes are made at all four sites and a Gigli saw guide and saw are passed paramedially from the posterior to the anterior hole bilaterally. A few sweeps are made with the saw on each side to create a groove. The saw is withdrawn and a heavy piano wire is passed between the anterior and posterior hole and then drawn into the previously made groove in the bone. The ends of the wire may then be fastened over a wooden or metal spreader so that traction may be exerted symmetrically in the plane or the body (FIG. 11). The wounds may be tightly closed over the wire with black silk sutures.

When the traction is to be discarded, Grant (19) has suggested that the wires need not be withdrawn but may be merely cut off in the depths of the scalp incisions. Zorn (40,41), in Germany in 1940, suggested the use of this method of traction after having applied it in 2 cases. Ehalt (14), in the same year, called attention to the fact that this method had been first devised and used successfully in 5 or 6 patients in America prior to Zorn's article.

When applying this method there is a potential complication of extradural hemorrhage from either the pacchionian granulations near the midline or from tearing a branch of the middle meningeal artery. The first source of hemorrhage is avoided by placing the wires sufficiently far laterally. The second potential source of hemorrhage has fortunately been no problem in the

few cases in which the author has used the method. Because of these dangers, it would appear that the method should be employed only by surgeons who are well versed in the control of extradural bleeding, if such an emergency should arise.

Maxillary traction. There are isolated instances in which there are fracture-dislocations of the cervical spine with associated severe or infected scalp lacerations and fractures of the skull and mandible which may cause abandonment of any of the other types of cervical traction. On the other hand, early reduction of the fracture-dislocation may be essential and new methods must be sought.

In 1947 Banzet and Bataille (2) were confronted with such a problem. The patient had sustained an atlantoaxial fracture-dislocation with a brachial monoplegia and progressive bulbar signs. There were also double fractures of the mandible, fracture of the right femur, and multiple infected scalp lacerations. Only one solid bony mass remained intact and that was the maxilla with its dental arch. An impression was made of the maxilla, a metallic brace substituted for it, and then this was held in place by interdental screws. Soldered to it were two square section tubes of German silver, to which two rods were attached. The latter came out of the mouth at the level of the commissures and turned back in the plane of traction. Reduction of the cervical fracture-dislocation was accomplished in 3 days with recovery from the brachial monoplegia. It was possible to treat the fractured mandible by traction with intermaxillary elastic bands.

Cervical trapeze enabling mobility with maintenance of traction. Hook and Mazet (25), in 1943, first introduced the cervical trapeze which consisted of a strong iron bar imbedded in a body cast that projected high above the neck posteriorly. A coiled spring was then attached from the Crutchfield tongs to the iron bar which was bent over the head. This enabled the patient to be ambulatory and would permit early, rapid, and "efficient mobilization of the patient in the event of any bombing." Chaves (8), in 1951, used the same principle except that the Crutchfield tongs, after reduction had been confirmed by x-ray examination, were incorporated into the body cast which was carried high up on the head. They reported successful use of their method in 50 cases.

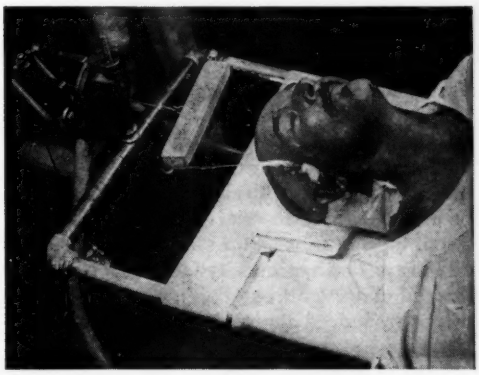

FIG. 10. Patient in fishhook cervical traction. The fresh parietal lacerations shown precluded the use of skeletal tongs. The figure also shows the tendency of the head to go into slight hyperextension when this method is used. (The hooks are not properly spread so that there is pressure on the scalp in the temporal area.)

A more refined technique of cervical traction trapeze has been sponsored by Abbott and Hale (1) in 1953. This consists of a cervical trapeze which may be imbedded in the shoulders of a fairly heavy shoulder or body cast. Tongs are

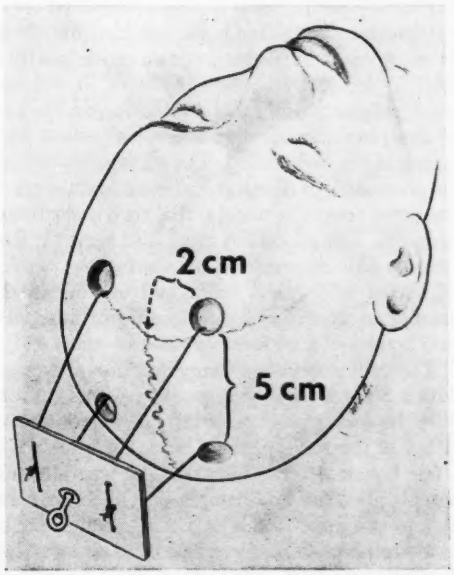

FIG. 11. Diagram indicating the preferred sites of burr holes for through-and-through steel wire traction. (Slight modification of the sites originally suggested by Hoen (24.)

inserted in the patient's head and the wire is passed upward to the pulley on the frame. A turnbuckle screw then may be used to increase the tension on the traction apparatus. The degree of tension exerted is measured by a scale which has been inserted within the traction system. The author has never used this method, but Abbott has employed it effectively in 12 cases. It should be used only in individuals with relatively slight fracture-dislocations who have no neurological disability. The opportunity for such a patient to be ambulatory during the period of cervical traction is indeed a most desirable feature.

CERVICAL TRACTION FOR ACUTE AND CHRONIC CERVICAL LESIONS OTHER THAN CERVICAL FRACTURE-DISLOCATIONS

The use of cervical traction has become very popular in patients with acute and chronic herniated cervical disc, hypertrophic spondylitis of the cervical spine, and various types of muscle spasm and pain about the head and neck. This is not without some dangers. The patient who has a history of pain in the neck with radiation into the upper extremity may have a herniated cervical disc, spondylitis, or a cervical spinal cord tumor. The patient who does have a cervical nerve root compression due to a herniated cervical disc or a protruding hypertrophic spur should in most cases be treated conservatively with a trial of cervical traction. However, it requires good judgment and careful attention on the part of the physician so that a cervical spinal cord tumor is not overlooked. The patient should not be permitted to develop irreversible changes in the nerve root or cervical spinal cord due to compression. The physician must also see to it that chronic pain does not expose the patient to drug addiction or marked functional overlay in the form of an anxiety neurosis, for surgical intervention is then of questionable value.

The ordinary Camp halter traction apparatus with a 5 to 8 pound weight may be used successfully in the supine position (as noted above) either at the hospital or at home for intervals of a few hours. After a brief rest the traction may be reapplied for another period. The disadvantage to this approach is that the patient must be in a supine position for traction to be effective. To facilitate movement on the part of the patient and enable other activities simultaneously, such as reading, knitting, and similar pursuits, other methods have been devised.

Zimmer bar. This apparatus consists of a curved or right angled bar which may be attached firmly to the back and one of the legs of a chair. The patient sits in a chair, is suspended in the cervical harness, and a rope is run upward over pulleys attached to the bar so that the weights hang at the back of the chair. Many patients prefer this to the reclining position. The only disadvantage is the bulkiness of the bar.

Hamby portable cervical traction apparatus. To combat such problems Hamby (21), in 1955, devised a portable traction contrivance that uses a hook which may be attached to a door. A rope may be run over the hook and the patient seated in a chair serves as the weight producing the desired degree of traction. There is a simple lever which permits loosening of the rope and release of the traction. This can be readily adjusted by the patient. The advantage to this apparatus is that it is simple, compact, and can be used in the home or in hotels by any person who is working or traveling and requires temporary cervical traction.

Motorized intermittent traction. Judovich (26) applied test traction to patients with cervical discomfort and found that by increasing the force 5 pounds at a time in some individuals the pain was aggravated at first until a pull of 25 or 35 pounds was attained. By repeated lateral cervical spine x-ray examinations he found that in 6 of 7 cases the earliest measurable changes in stretching the cervical spine were noted when 25 pounds of traction were applied. It was difficult for the patient to stand a continuous pull of as little as 8 pounds, but with a motor driven mechanism including a cam and alternating pressure and release at brief intervals, the sitting patient could tolerate much heavier traction for longer periods and had excellent relief from symptoms whereas other conventional traction methods had failed. The use of this machine should be avoided in midline cervical discs, hypertension, acute torticollis, acute myositis, and in malignancy.

Shenkin (35) employed Judovich's type of machine on 27 patients, all of whom were having such severe pain that they would ordinarily have been candidates for surgery. The patients were treated in the supine position with a pull of 5 pounds and a release of traction for 5 seconds. Traction would last for one hour and then there was a 15 minute rest period. The traction was maintained for a total of 12 to 14 hours a day. Only 5 of his patients did not respond to this therapy and required operation.

Each of the described methods of traction has its place. There is a tendency for the surgeon to select one of them and press its use to the exclusion of the other types. Instead, the group should be viewed as an armamentarium from which the most effective instrument or method should be selected to treat the individual patient.

For example, halter traction may be used during periods of transportation or during the brief interval while a proper bed or Stryker frame is being prepared. However, this is not a satisfactory long term apparatus because of the inability to apply sufficient weight to accomplish reduction, the development of pressure sores, and the pronounced discomfort to the patient.

On the other hand, the patient with a severe scalp infection, scalp laceration, or skull fracture lying within the zone of insertion of Crutchfield or Vinke tongs cannot be subjected to these types of skeletal traction. In such instances the application of fishhooks under the zygomatic arch bilaterally for traction purposes may be a satisfactory solution to the problem, or if there have been extensive fractures in this region perhaps the use of a metal molded plate to the maxilla may be effective.

The lack of satisfactory tongs or the finding of a thin skull on roentgenogram examination of a child may preclude the use of tongs for skeletal traction. The Hoen method of inserting burr holes with wires drawn through them parallel to the superior longitudinal sinus may provide an excellent method of traction.

Occasionally, the patient with a cervical fracture-dislocation will be subjected to an early decompressive laminectomy, and the high level of the lesion or the poor condition of the patient precludes immediate or primary spinal fusion. The patient may be maintained in alignment by traction with Vinke tongs for perhaps 10 days or 2 weeks prior to a secondary cervical spinal fusion operation. After the spinal fusion the surgeon may feel that stabilization is necessary for an additional 8 to 10 weeks to insure proper callus formation and solid union. In such an instance it may be advantageous, after a 6 or 8 week period, to shift from the Vinke tongs, which insert low on the skull, to the Crutchfield tongs. The sites of insertion of the Crutchfield apparatus lie higher near the vertex of the skull. For this reason the dangers of infection and penetration of the skull, which arise from prolonged fixation of the skeletal apparatus near the old drill hole sites, are eliminated, and prolongation of the traction interval is permitted.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Epiphora and the Bony Nasolacrimal Canal. CALBERT I. PHILLIPS and MARIAN GEORGE. *Brit. J. Ophth.*, 1956, 40: 673.

ROENTGENOGRAMS of the nasolacrimal canal ("end-on") were obtained in patients complaining of epiphora and were compared with the bony canal of normal patients. The pictures were taken by directing the beam along the axis of the canal and by placing the film horizontally in the mouth.

The patients in this study had no abnormality of the puncta or canaliculi, and no facial injury of or surgery performed on the passages. The age, sex, and status of the normal patients were comparable to those of the involved group.

The conclusion was that there is no relationship between the size of the inlet of the bony nasolacrimal canal and the epiphora. —*Earl H. Merz, M.D.*

The Treatment of Exophthalmos from the Ophthalmologist's Viewpoint. JOHN W. HENDERSON. *Arch. Ophth.*, Chic., 1956, 56: 678.

THE MANY CONDITIONS within the orbit, which may produce exophthalmos, can be considered from the standpoint of four main categories; namely, inflammatory lesions, vascular anomalies, metabolic disturbances, and orbital tumors, including pseudotumors.

The management of inflammatory lesions is generally nonsurgical. Eradication of vascular anomalies is best done by a combination of excision, ligature, and electrocoagulation. The medical management of metabolic disturbances leading to exophthalmos should be left to the internist, with the ophthalmologist taking over when surgical relief of the proptosis is considered. The treatment of orbital tumors is primarily surgical, and it is often supplemented by roentgen therapy.

Tonography in the Clinical Management of Glaucoma. HAROLD G. SCHEIE, ROBERT W. SPENCER, and ERNEST D. HELMICK. *Arch. Ophth.*, Chic., 1956, 56: 797.

THE AUTHORS discuss the value of tonography in the clinical management of glaucoma.

Primary glaucoma may be divided into wide-angle (or chronic simple) glaucoma and narrow-angle (or the acute congestive neurovascular type) glaucoma. Each type has a characteristic course and response to treatment.

It had been observed that the ocular tension fell more slowly in glaucomatous than in normal eyes under the influence of the pressure of a tonometer applied repeatedly at short intervals or after prolonged application.

Grant used an electronic tonometer connected to a paper strip recorder to obtain a continuous tracing of the ocular tension while the tonometer was continuously applied to the eye over a 4 or 5 minute period. He was able to calculate the coefficient of facility of aqueous outflow in cubic millimeters per minute, per millimeter of mercury pressure.

The authors found a range of coefficient of outflow of aqueous in normal eyes from 0.11 to 0.42 cubic millimeters per minute, per millimeter of mercury pressure; the average was 0.22. They point out that any value below 0.16 should be regarded as indicative of glaucoma.

Tonographic values before and during water provocative tests were analyzed for any evidence that they might contribute toward explaining the mechanism of the rise of tension. The effects of miotics on tonographic values were observed for possible explanations of the mechanism of action of miotic agents in the treatment of glaucoma. Tonographic studies were also done on a group of patients with possible glaucoma who had ocular tensions in the upper limits of normal but showed little or no other evidence of glaucoma, and the results were compared with those of other diagnostic tests and clinical findings. Tonography was also used on miscellaneous types of glaucoma.

The conclusions are based on 600 tonographic studies, utilizing the method described by Grant, on 239 eyes with various types of glaucoma. The authors concluded that tonography offers valuable support to the gonioscopic classification of glaucoma.

Tonography indicates that acute congestive glaucoma occurs as a result of angle closure. During acute congestive attacks aqueous outflow is markedly diminished, but is normal after the attack is terminated by medical means.

The coefficient of aqueous outflow is diminished in chronic simple (wide-angle) glaucoma in proportion to the severity of the disease. In this type of glaucoma, tonography is not so reliable as the water provocative test. The latter causes a rise in intraocular tension by producing an increased rate of aqueous flow through the eye. Miotics cause an increase in the coefficient of aqueous outflow.

The coefficient of aqueous outflow is diminished in glaucoma after cataract extraction, in glaucoma secondary to an inflammatory process, and in juvenile glaucoma. —*Joshua Zuckerman, M.D.*

The Iris Inclusion Operation in Glaucoma. RANDAL F. ELLIOTT. *N. Zealand M. J.*, 1956, 8: 43.

THE AUTHOR indicates the advantages of the iris inclusion operation for chronic simple and for congestive glaucoma. In narrow-angle congestive glaucoma an absolute cure can be expected only in early cases; in chronic simple glaucoma any operation will only delay the destruction of vision, but possibly for more than 25 years. The iris inclusion operation offers the best prognosis. The technique of operation based on that of Weekers is a considerable improvement on the more widely used techniques of Holth and Herbert.

Miotic drops are discontinued 12 hours before operation to ease performing the iris inclusion. A superior rectus bridle suture is placed. A flap of conjunctiva with Tenon's capsule is prepared with scissors starting 8 millimeters above the limbus without dissecting the conjunctiva and episclera away from the corneoscleral margin to ensure a thick flap. The flap is turned down as far as it will go with a few sweeps of a dry gauze swab. An incision, 5 millimeters long, is made about 2 millimeters behind the apparent limbus by a vertical ab externo approach with a Gillette D. blade or a Bard-Parker No. 15. The anterior chamber is entered quite boldly. The posterior lip of the incision is depressed and the eye is decompressed slowly. As the iris presents, it is grasped first with forceps and withdrawn slightly and then again with another forceps applied near the pupillary margin which presents in the wound. The iris is now torn meridionally from the pupillary margin to the base and the two pillars of the iris are left in the lateral ends of the wound. No iris is removed. If the iris does not prolapse spontaneously it can be picked up very peripherally and drawn into the wound, and if this is not possible, because of synechiae or an atrophic iris, the operation can be converted into a sclerectomy or flap sclerotomy. The conjunctival flap is then stroked back into position and sutured into place.

Postoperatively, pilocarpine is instilled twice daily, with cortisone and an antibiotic. The suture is removed on the fourth day and massage is started at once unless there is any tendency to hypotension.

The iris inclusion operation is contraindicated in secondary glaucoma, thrombotic glaucoma, absolute glaucoma, aphakic glaucoma, rubeosis iridis, buphthalmos, and in those cases of congestive glaucoma that result from intumescence of a cataract.

—*Joshua Zuckerman, M.D.*

Lymphocytoma of the Orbit. B. K. DAS GUPTA, G. C. SEN, and R. K. BASU. *Brit. J. Ophth.*, 1956, 40: 669.

A CASE of lymphocytoma of the orbit is presented with a full pathologic report. A brief review of benign lymphomatous tumors also is given.

The tumors are strictly localized, may have multicentric existence anywhere in the body, and have been classified as follows: (1) the lymphocytic cell type in which the cells are small and round, the cytoplasm is scanty, and nuclei is dark; (2) the reticulum cell type whose cells are large and pale with vesicular nuclei; and (3) the giant follicular type.

The symptoms may be a mass in the orbit, conjunctiva, or skin, unilateral exophthalmos, proptosis, optic atrophy, or papilledema. —*Earl H. Merz, M.D.*

Combination Therapy of Retinoblastoma with Triethylene Melamine and Radiotherapy. GEORGE A. HYMAN and ALGERNON B. REESE. *J. Am. M. Ass.*, 1956, 162: 1368.

THE AUTHORS report the results of combination therapy of retinoblastoma. They point out that retinoblastoma, a uniformly fatal disease occurring in children between the ages of 6 and 24 months, advances by direct extension along the optic nerve into the central nervous system or via the blood stream to skin, skeleton, and other organs.

Because radiation therapy had resulted in the late occurrence of hemorrhagic retinitis and a high percentage of failures (requiring eventual enucleation) other modes of therapy were tried. Of these the additive effect of the nitrogen mustard analogues seemed to offer hope. Accordingly, a study of the possibility of synergism between radiotherapy and triethylene melamine therapy was started in 1953 at the Institute of Ophthalmology and Columbia-Presbyterian Medical Center in a series of 50 children with retinoblastoma.

A series of cases in which the disease had not extended beyond the local area was radiated with 2,400 roentgens in air through each of 2 portals. Triethylene melamine was given by mouth originally and later by intramuscular injection or by instillation into the internal carotid artery, the dosage being adjusted according to the weight and hematologic response of the patient.

The tumor was arrested and the vision preserved, as judged from subsequent observation over a period of at least 6 months, in 12 of 33 children who received the drug by mouth. The tumor growth was arrested and useful vision was retained in 7 of 8 children who received the drug intramuscularly. The intracarotid route was used in 9 far advanced cases that had been classified as "almost hopeless." The tumor was arrested and useful vision preserved in 2 of these patients. The results obtained are better than those obtained in the past in a comparable series of cases treated with radiotherapy alone.

Complete blood cell and platelet counts are a necessary and useful guide to the dosage and prevention of potentially severe toxic reaction from the drug. When given by mouth, the drug produced the maximum leukopenia in about 9 days; intramuscularly (the preferred route) in about half that time.

Triethylene melamine was selected originally because it was available in a form for oral administration. It was given orally with 2 grams of sodium bicarbonate with the patient in the fasting state, and ocular radiotherapy was instituted 24 hours later. The second dose of triethylene melamine usually coincided with the last treatment of radiotherapy, and the third dose was given after radiotherapy was completed but within the time period of its continued direct effect.

A new preparation of triethylene melamine is currently being used for parenteral admininistration.

Eight patients have been treated with intramuscular injections and 9 with injections of the internal carotid artery. The fasting patient is given about 0.1 milligram per kilogram of body weight intramuscularly by means of a 2 cubic centimeter tuberculin syringe using a 5 milligram bottle of triethylene melamine to which had been added 5 milliliters of isotonic sodium chloride solution (kept refrigerated). The solution was mixed immediately before administration. The exact amount (equivalent in millimeter to milligram of drug) was withrawn and promptly injected intramuscularly. No food or water was given orally for 4 hours, then water or ginger ale for the next 4 hours, and then other clear fluids for the third 4 hour period. This was followed by a full fluid diet and a light diet, as tolerated, after an additional 4 hours. The patient, if afebrile and not vomiting, was discharged about 24 to 36 hours after treatment.

The tumors in 12 of 14 patients, or 85 per cent, apparently have been arrested and useful vision has been retained. Extension of the group to include all but the "almost hopeless" shows that the tumors in 18 of 29 patients, or 62 per cent, apparently have been arrested and that useful vision has been retained.

The total dose employed has been empirical, with an average course of 15 milligrams orally or 6 to 10 milligrams intramuscularly extended over a 6 to 12 month period. —*Joshua Zuckerman, M.D.*

Meningioma (Dural Endothelioma) of the Optic Nerve; Report of a Case. SHEPARD N. DUNN and FRANK B. WALSH. *Arch. Ophth.*, Chic., 1956, 56: 702.

THE AUTHORS report a case of meningioma of the optic nerve observed in a male child at the age of 11 years and again 17 years later.

The tumor seemed to originate in the optic disk. Enucleation was advised but rejected. Seventeen years later the appearance of the right eye was unchanged but the left now presented optic atrophy, loss of temporal field, and vision of 20/100.

Enucleation of the right eye at this time revealed psammomatous meningioma of the choroid and of the optic nerve and its sheaths.

Frontal craniotomy revealed a tumor which extended from the right optic canal, surrounded the optic nerve and the carotid artery, and involved the chiasm and the left optic nerve. As much of the tumor was removed as was possible without removing any of the bone. Histologic examination of the tumor revealed a psammomatous meningioma.

It is pointed out that (1) meningiomas which originate within the orbit may spread into the cranium, and that those arising within the cranial cavity may encroach upon the orbit; (2) they are slow-growing, as exemplified by the absence of change in the fundus over a period of 17 years; (3) proptosis and limitation of ocular movements, usually present in tumors of the orbit, may be absent, (as they were in this case); (4) a normal optic canal does not eliminate the possibility of a tumor that extends through the canal from the orbit to the cranial cavity or vice-versa (there was no demonstrable erosion of the canal wall in this case); and that (5) invasion of the optic nerve by meningioma and its presence within the eye is an unusual but not a unique feature. —*Joshua Zuckerman, M.D.*

NECK

The Late Results of Surgical Treatment for Thyrotoxicosis. STIG BORGSTRÖM. *Acta chir. scand.*, 1956, 111: 351.

IN THIS STUDY 279 patients were followed for from 15 to 28 years after subtotal bilateral thyroidectomy done for thyrotoxicosis at the Department of Surgery of Lund's Lasarett in Sweden. All patients had had comparable preoperative (Lugol's solution) and operative management. Local anesthesia was employed in all cases. The composition of the series was similar to most of the other series reported as regards age distribution, the proportion of diffuse and nodular goiters, age at operation, and preoperative basal metabolic rate.

One of the notable observations was the high incidence of postoperative tetany (5.7 per cent) and the very late onset of recurrences. When hypoparathyroidism occurred, it usually required periodic treatment for 15 years after operation. Seven of the 17 patients in this group required continuous calcium and fortedol administration; 3 of these patients required bilateral cataract operations. This high incidence may speak for the radical character of the surgery performed.

Among the several interesting findings, perhaps the most outstanding was the large number of patients with hypertension and with emotional instability 15 or more years after thyroid surgery. This could not be attributed to a persistently high basal metabolic rate, since most patients in this category had a normal basal metabolism at the time of follow-up.

Some interesting speculations are made on the possible relationship between a once-high basal metabolism and the pathogenesis of essential hypertension, as well as the persistent emotional instability. Certainly the activity of the thyroid gland might well be studied more carefully in relation to the still perplexing problems of hypertension and arteriosclerosis.

Statistical analysis of late mortality revealed another noteworthy finding. During the first 5 postoperative years, the mortality of this group was no different from that of the general population. However, with the further lapse of time an excessive mortality was noted, especially in the females of the series; the high mortality was due mainly to disease of the circulatory organs. —*Harold Laufman, M.D.*

When Is Extensive Radical Operation Indicated in Malignant Struma (Wann ist bei der malignen Struma die erweiterte Radikaloperation angezeigt)? P. HUBER. *Klin. Med.*, Wien., 1956, 11: 417.

THE AUTHOR discusses the question of choosing the cases of thyroid carcinoma in which the regional lymph nodes should be extirpated in addition to the removal of one or both lobes of the thyroid.

There is a great divergence of opinion as to the solution of this problem. One group of surgeons postulates radical neck dissection in all cases; some even recommend opening the anterior mediastinum and removing the lymph nodes in this space. In contrast to this group, other authors point out that the possible improvement of the final result is not in proportion to the immediate danger and other disadvantages of radical neck dissection. Furthermore, they question

whether the routine extirpation of all the not affected lymph node filters really prevents the spread of the carcinoma, or if, on the contrary, it could contribute to the production of metastases. One author, analyzing a very large series of 30,000 strumectomies, comes to the conclusion that a permanent cure is a purely biologic phenomenon and does not depend on the extent of lymph node extirpation.

The writer emphasizes that the degree of malignancy varies very widely in the individual cases. This knowledge may lead to quite opposite conclusions. On the one hand, it may be argued that tumors of low malignancy have a comparatively good prognosis and that a very radical operation is unnecessary and should be reserved for aggressively infiltrating tumors. On the other hand, it may be assumed that in very malignant carcinomas even extensive radical operations are not able to improve the results. If, however, the radical method is applied also in the cases of lower malignancy, the patient may have an even better chance to remain free from recurrences without the secondary removal of later affected lymph nodes being necessary.

The acceptance of one of these two conclusions depends partly on the temperament and the skill of the individual surgeon. The author gives the following suggestion for management:

1. If the tumor has not penetrated the capsule and lymph nodes are not palpable, the operation is limited to unilateral strumectomy without removal of the lymph nodes.

2. If the tumor has penetrated the capsule and infiltrated the surrounding muscles, is adherent to the internal jugular vein, or has grown towards the space between the esophagus and the trachea, the lateral cervical triangle should be extirpated. However, the author does not believe that this procedure changes the prognosis considerably.

3. If lymph nodes are palpable they should be removed. If they are well demarcated and can be easily dissected from the surrounding tissue only the affected nodes are extirpated. If, however, they are adherent to each other total extirpation of the lateral triangle, including the internal jugular vein, is performed.

4. The incision after Roux-Berger gives poor cosmetic results, and is used only if the lymph nodes extend to the mandibular angle. In all other cases the usual collar incision is extended laterally.

The author was led to make these recommendations by the experience that, in the overwhelming majority of his patients who survived for many years, either no lymph nodes at all or only those which showed maccroscopically carcinomatous degeneration were removed. He states that routine radical neck dissection is not only hazardous, but also unsuccessful in those patients in whom metastases are disseminated, not by the lymphatic circulation, but by the blood stream. His experience with the treatment of malignant strumas showed that if no lymph nodes were touched at the time of strumectomy, subsequent extirpation of isolated nodes was often necessary months or years after the operation, but that the process came to a standstill finally and permanent cure was accomplished. His material included 275 cases of malignant strumas during a period of 10 years; Of these 103 had survived for more than 5 years; in the others, the time interval between the operation and the publication of this article was less than 5 years.

Bilateral thyroidectomy is indicated in the following conditions: (1) when the tumor has invaded the contralateral lobe through the isthmus; (2) when a multicentric growth is present in both lobes; (3) when in the case of removable metastases, it is uncertain from which lobe the metastases originated; and (4) when the surgeon intends to intensify the storage of radioactive iodine in a metastatic lesion by extirpation of the thyroid. However, the author states that this last indication will arise very rarely. He has never seen a case in which isotope therapy of the metastases was successful, even after thyroidectomy.

—*Werner M. Solmitz, M.D.*

Some Observations on the Incidence of Thyroid Cancer in the United States. PIERO MUSTACCHI and SIDNEY J. CUTLER. *N. England J. M.*, 1956, 255: 889.

THE AUTHORS describe the fallacy in the usual methods of reporting the incidence of thyroid cancer based on the records of individual hospitals or the aggregate experience of several hospitals. The results, ordinarily expressed as the number of cases in pre-established categories or as percentile ratios of the number of cases in each category to the total series of hospital admissions, are meaningless when applied to the general population because these figures are based on various local selective factors.

A review of the figures derived in this manner by various authors with their individual method of statistical survey is presented.

The data used in this study were based on a 12-month survey conducted by the National Cancer Institute on morbidity from cancer in the United States. Ten metropolitan areas were selected so that the north, south, and west were proportionately represented. The survey was designed to obtain reports on all patients with cancer seen in hospitals, clinics, and physicians' offices for a 12 month period.

Cancer of the thyroid gland was newly diagnosed in 336 persons (of a total population of 14,600,000), 30 of whom were nonwhite. The age-adjusted annual incidence rate was 2.3 cases per 100,000 population (white) and 1.8 cases per 100,000 population (nonwhite). The rate in females (3.4) was practically three times that in males (1.2), and the risk of thyroid cancer was the same in the white and nonwhite woman.

Detailed study of the number of cases in various age groups demonstrated that the risk of thyroid cancer increases with age in both male and female, although this tendency in males is not so apparent until after the age of 50, in contrast to females in whom the risk increases from 15 years on.

When the type of cancer (papillary or nonpapillary) was examined, it was found that aging does not seem to affect the risk of papillary adenocarcinoma as unequivocally as it influences the risk of the other histologic types. It appears that the nonpapillary varieties are entirely responsible for the increasing incidence in the older age groups.

The incidence of thyroid cancer was found to be the same in northern and southern women in spite of the dissimilarity of their experience with endemic

goiter, which tends to discount the latter as a significant etiologic factor. The highest incidence of thyroid cancer was in the West.—*Arthur M. Simpson, M.D.*

The Value of Radical Thyroidectomy in the Treatment of Thyroid Cancer. MARCEL DARGENT. *Brit. M. J.*, 1956, 2: 1138.

THEORETICALLY, a one-stage block dissection for carcinoma of the thyroid is felt to be justified by "four indisputable pathologicoanatomic facts": (1) the high incidence of unilateral tumors of the thyroid parenchyma without involvement of the opposite lobe; (2) the possibility of the spread of the growth along the cervical aponeuroses and more particularly, the sheath of the infrahyoid muscles; (3) the frequent invasion of the lymphatics and the risk of the development of cervical lymphatic malignancy; and (4) the frequent invasion of the venous drainage of the gland and even of the internal jugular vein.

The operation consists of extirpation of the lobe, the surrounding muscles, and all planes of the neck on the ipsilateral side, including the internal jugular vein. Ligation of all the jugular veins on the operative side is done at the outset to prevent dissemination insofar as possible. An effort is made to preserve the external branch of the spinal accessory nerve if it is not involved with malignant nodes. The submaxillary region is never included in the dissection, since the author has never found these nodes to be involved, nor has he noted recurrence in that area.

Total radical thyroidectomy was performed for carcinoma of the thyroid in 50 cases. The presence of distant lesions did not necessarily contraindicate the radical procedure. From the survival figures it would appear that the indication for this operation is papillary or pleomorphic carcinoma of slow evolution and with cervical lymphadenopathy. It is also indicated when local recurrence follows a partial thyroidectomy. In those forms of cancer which are slow growing and already metastasizing, but still limited, the radical operation, done together with complementary radiotherapy and irradiation or removal of any metastasis, gives better results than total thyroidectomy. With anaplastic carcinomas or sarcomas, it appears to be of little benefit to perform the radical operation. The author does not recommend that the procedure be done prophylactically when evidence of local metastasis is wanting and the lesion seems localized to the gland itself. —*Sheldon Oscar Burman, M.D.*

Lateral Cervical Thyroid Metastases; a Follow-Up Study of 39 Cases. JØRGEN B. DALGAARD and PER WETTELAND. *Acta chir. scand.*, 1956, 111: 431.

THIS REPORT is the first of a series of articles dealing with aberrant thyroid tissue. It includes material from 1,300 thyroid biopsy specimens examined during the period from 1930 to 1954. There were 95 specimens of aberrant thyroid, 45 of which came from a lateral cervical location in 39 patients. No metastases from already known carcinomas of the thyroid gland are included. Two theories concerning the origin of lateral cervical thyroid tumors are reviewed. The dysontogenic theory maintains that these growths are developmental anomalies arising from misplaced thyroid primordia. A metastatic theory holds that these lateral masses are actually spread to lymph nodes from a tumor of the homolateral thyroid gland.

The authors espouse this latter belief, which they feel has gained strong support in recent years. This follow-up study was conducted on 39 patients up to 24 years after the initial operation for a lateral thyroid mass. The first group of 15 patients were those on whom a homolateral thyroid lobectomy had been performed. In every case, histologic examination of the homolateral lobe revealed a primary carcinoma. The 12 patients in the second group had not had homolateral lobectomy, but in these the clinical diagnosis of thyroid carcinoma had been made. A third group of 12 patients, of a younger average age, had no thyroid gland resection, and demonstrated no evidence of thyroid tumor on physical examination. Five of the patients in this third group have shown minor recurrences or new lateral nodes on re-examination.

Thirteen of the 15 lateral thyroid tumors in the patients of the first group showed papillary thyroid tissue, the other 2 being carcinomas. In each of groups 2 and 3, 10 of 12 specimens were mostly papillary tissue, and the other 2 in each group were carcinomatous. Numerous photomicrographs of this material are included. In the entire series 13 patients had died within the observation period, 2 of unrelated causes, 11 of their thyroid cancer, and 1 more will probably succumb to this malignancy.

The 27 patients in the first 2 groups were found to have thyroid carcinomas after the removal of lateral thyroid growths. Accordingly, the authors believe that this is impressive evidence of the metastatic nature of these lateral lesions. They relate the lack of obvious primary cancer development in the third, younger group of patients to the fact that some thyroid tumors grow quite slowly, often metastasize late, and that even lateral metastases remain stationary for several years. Five of the last group of 12 patients also had received radiation therapy.

Hemithyroidectomy, therefore, is strongly recommended for all patients with lateral cervical thyroid tumors. Radical block dissection, including removal of the sternocleidomastoid muscle, seems unwarranted. The limited use of postoperative irradiation or I^{131} in the authors' series has appeared helpful, and even in cases of local recurrence the prognosis has not been too unfavorable.—*Emile J. Meine, Jr., M.D.*

Three Unusual Cases of Hyperparathyroidism. D. J. M. CRAWFORD, J. STEFANELLI, and A. F. ALVAREZ. *Brit. J. Surg.*, 1956, 44: 193.

THREE VERY INTERESTING cases, demonstrating many unusual aspects of primary hyperparathyroidism, are reported in detail. One case occurred in a 3 year old boy and was manifested mainly as a skeletal defect. Typical alteration in the serum calcium and phosphorous levels was found and reversed after the removal of a parathyroid adenoma.

In the second patient a peptic ulcer developed following the initial removal of normal parathyroid tissue. The patient had a subtotal gastric resection and further gastric resection and vagotomy for a recurrent ulcer. A second exploration of the neck was performed when a second recurrent ulcer was demonstrated. This operation revealed two parathyroid tumors which

proved to be parathyroid adenomas on microscopic section. Gastrointestinal complaints and roentgen evidence of ulcer disappeared following the removal of the parathyroid adenomas.

The third patient died of the renal complications of hyperparathyroidism despite removal of a parathyroid carcinoma without evidence of spread. This case emphasizes the insidious nature of hyperparathyroidism in some patients. Irreparable renal damage had occurred before a diagnosis was made. The early symptoms consist principally of ill-defined pain in the abdomen and limbs, anorexia, weakness, lassitude, polydipsia and polyuria. Peptic ulceration and nephritis are frequently suspected and, indeed, may be present and demonstrated by suitable investigation. The importance of recognizing the coexistence of peptic ulceration is important because treatment with standard diets and antacids will lead to a high calcium intake which could precipitate acute hyperparathyroidism with crisis and death. The onset of persistent vomiting and deterioration in patients with peptic ulcer who are undergoing adequate treatment should alert one to the possibility of unrecognized hyperparathyroidism.

It is of interest that the serum calcium levels can fluctuate widely in hyperparathyroidism and repeated assays are advisable. The serum phosphorus level in contrast is constantly depressed.

Concerning the technical aspects of the operation, a wide incision and meticulous hemostasis are essential. All parathyroid tissue should be exposed before any is excised. The presence of one adenoma does not exclude the presence of others. Sternotomy is not often required. Thyroidectomy is recommended when all other lines of attack have failed to detect the parathyroid lesion. —*Lloyd D. MacLean, M.D.*

Tumor of the Jugular Glomus Developing Intravenously; Complicated by a Jugulocarotid Fistula (Tumeur du glomus jugulaire à évolution endoveineuse, compliquée de fistule jugulocarotidienne). H. Vascoboinic. *J. chir.*, Par., 1956, 72: 703.

Since tumors of the jugular (or tympanic) glomus are being diagnosed more frequently by otolaryngologists and neurologists, the author presents this case to demonstrate the role surgery can play in the therapy of certain forms and complications of these lesions.

A 60 year old man entered the hospital with a 15 year history of a left facial paralysis. Simultaneous with the onset of the paralysis, a "benign polyp" was removed from his left ear. The polyp soon recurred. In the intervening years he noted progressive deafness of the left ear, tinnitus, and dysphagia. Ten years following the onset of his symptoms, a pulsatile tumor of the left parotid area was noted. On admission, generalized cardiac enlargement was present. A left peripheral facial paralysis, paralysis of the ninth, tenth, eleventh, and twelfth cranial nerves, and total deafness on the left was found. A polyp was present in the external auditory canal, just distal to the meatus. A firm pulsatile tumor of the left side of the face and neck was present, which extended from the mastoid to the clavicle and displaced the trachea slightly to the right. A continuous thrill and bruit characteristic of auriculoventricular fistulas was present over this mass. The thrill could be obliterated by carotid compression. The internal jugular vein and common carotid artery were ligated at the base of the neck with a diminution in the size of the tumor and a decrease in the signs and symptoms.

Within one week, however, the patient's findings were the same as they had been preoperatively. A second operation was performed with an en masse resection of the tumor with the carotid and jugular vessels. Examination of the specimen revealed the carotids to be greatly dilated but otherwise normal. The jugular vein appeared normal externally. The wall of the vessel, however, was very thin. Its diameter measured 5 centimeters in length. The lumen of the vein was filled with a tumor measuring about 15 centimeters, and having an irregular spongy, fleshy appearance. It was covered with fibrin, and adherent in only one small area to the carotid artery. In this latter area, a communication between the vessels was present. Microscopic examination of the tumor revealed it to be an angioreticulosarcoma.

The author also discusses certain diagnostic and therapeutic features of the glomus tumors and refers to the pertinent literature.—*J. C. Rosenberg., M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

The Diagnosis and Treatment of Trauma to the Central Nervous System. RICHARD C. SCHNEIDER. *Med. Clin. N. America*, 1956, 40: 1369.

THE AUTHOR completely reviews the neurosurgical approach to trauma of the nervous system, including modes of examination and ancillary tests such as lumbar puncture and roentgenograms. He outlines the disposition of a case from the time of first observation in an attempt to make clear which patients demand hospital care and special observation. Prognosis in the various types of trauma to the craniocerebral structures is outlined and general management of the hospitalized patient is described. Acute trauma of the spine and spinal cord are handled in the same fashion, with a description of examination, means of transportation, and the optimal time for and proper management of the patient during x-ray examination.

He considers the grounds for immediate surgical examination to be: progressive neurologic signs, complete block, compound fracture of the spine, or the syndrome of acute anterior cord injury. The indications for deferred surgical intervention are: correction of the spinal deformity whether or not there is transection of the cord and spinal fusion for relief of instability. The contraindications to operation are: traumatic shock, fracture dislocation at the third to fourth cervical vertebra, immediate and complete paralysis without block, and the syndrome of acute central cervical spinal cord injury. In this syndrome there is immediate motor impairment which is more pronounced in the upper extremities, sphincteric involvement, and various degrees of sensory loss. This is believed to be caused by edema centrally or hematomyelia, and is associated with a moderately good chance for recovery without operation. This syndrome is contrasted to the acute anterior cord injury syndrome in which there is an immediate complete paralysis of the extremities without a level of hyperesthesia and hypalgesia and with preservation of touch, motion, and vibration sense. These patients may have a ruptured disc with compression or destruction of the anterior spinal cord. Their signs do not progress and there is no block. The medical nursing care of the patient with spinal cord injury, including the prevention of decubiti, bladder care, and the prevention of respiratory complication, are described. The relief of pain and the problem of flexor spasm are briefly described. An excellent bibliography is appended.

—*Edward B. Schlesinger, M.D.*

The Treatment of Fresh Head Injuries (Die Versorgung frischer Kopfverletzungen). W. TÖNNIS and R. A. FROWEIN. *Wien. med. Wschr.*, 1956, 106: 933.

THE AUTHORS present a clear and short discussion on the treatment of acute craniocerebral injury. First attention is paid to the respiratory pathway in the comatose patient. It includes the introduction of a nasopharyngeal tube to keep the upper airways open and for suction of the trachea. If this treatment is not satisfactory, if there is extensive trauma to the facial muscles, the nose, and the palate, or if the patient remains irresponsive for more than 3 days, tracheostomy should be done. The patient should be given oxygen, and his stomach and bladder should be emptied.

Attention should also be paid to the circulation of the blood. Because of the centralization of the circulating blood volume in some organs, it becomes necessary to increase the volume in the general circulation by infusion of blood or blood substitutes. This increases the blood depot in the lungs and the volume to the heart, and improves the pulse, blood pressure, and circulating volume. At the same time the authors recommend the administration of ganglionic blocking agents such as hydergine, phenothiazine, and pendiomid. These agents have a tranquillizing effect on the motor agitation which is often present. The patients are also kept cool by fanning.

From the second day on, disturbances occur in the protein and electrolyte balance. There is a drop in the serum albumin which is best treated by blood transfusion again. No systematic changes are seen in the blood potassium level. However, there is a sharp rise in the serum sodium level. The sodium level usually reaches normal again after the fifth post-traumatic day. On the second day one also notices a decrease in the sodium concentration of the urine, while the potassium concentration remains the same or increases slightly. It becomes necessary to treat the patient for sodium retention and therefore it is an error to give him sodium chloride solution. The patient is thus treated by giving him 1,000 to 2,000 c.c. of 5 per cent or 10 per cent dextrose solution. Diamox may help in keeping the kidney from resorbing sodium.

If after the fifth posttraumatic day the patient's condition does not improve, it may be complicated by an insufficiency of the adrenal cortex and cortisone may be of help.

Operative treatment of closed cerebral injury is indicated only in extensive depressed fractures in which dural and cerebral substances have been injured. Penetrating injuries also need to be repaired immediately. It may often be important to close the scalp defect with a flap. It is very important to have the dura closed. If necessary, a galeaperiosteal flap may be employed to close it.

Because of the danger of early or late infection, it is important to repair all penetrating injuries of the base of the anterior fossa. These injuries are usually connected with the paranasal sinuses or the orbits. They should be repaired as soon as possible with closure of the dura or a duraperiosteal plastic flap.

The complications of open as well as closed head injuries are hemorrhages, aneurysms, cerebrospinal fluid fistulas and pneumatoceles. While the subdural hemorrhage is the most common, it is difficult to diagnose. More than half of the patients who had subdural hematomas did not lose consciousness following

the head injury. The interval between injury and the appearance of symptoms is variable and may last from a few minutes after the injury to 3 months. More than half of the patients are asymptomatic during this interval. Later on the patients develop disturbances in the state of responsiveness, pyramidal tract signs or speech disturbances, and disturbances in the pupil; in about half of the patients papilledema can be seen. Only 4 of 59 subdural hematomas were bilateral. The diagnosis of subdural, as well as epidural, hematoma is best made by angiography. The prognosis of epidural hematoma is usually poor as it does not depend on the hematoma itself but on the brain stem lesion. Treatment of the subdural hematoma consists of drainage of the hematoma followed by filling of the lumbar subarachnoid space with physiologic salt solution. This is done to overcome the hypotensive condition which keeps the brain from expanding within the dural cavity and may result in the formation of a new hematoma or exudates. In occasional rare cases craniotomy is required for removal of the entire subdural sac with its membranes and contents.

Posttraumatic intracerebral or intraventricular hemorrhages are very rare. Obliteration of the basal cisterns by subarachnoid bleeding may eventually result in disturbances of the cerebrospinal fluid circulation and hydrocephalus. The patients usually present hypotonia of the lower extremities with the Babinski sign. Decompression of the posterior fossa often is of value.

Posttraumatic aneurysms are relatively rare. However, in cases of sphenoid or petrous fractures a bone spicule may penetrate the internal carotid artery and the cavernous sinus, and produce an arteriovenous fistula. The patients develop a loud bruit and usually paresis of the eye muscles with exophthalmos and venous stasis of the eyelid and conjunctiva. Angiography of the opposite side is indicated with compression of the homolateral carotid to evaluate the intracranial collateral circulation. Following this procedure, it becomes necessary to ligate the carotid artery. The authors recommend ligation of the common carotid artery, followed by ligation of the internal carotid 8 days later.

Cerebrospinal fistulas occur after fractures in the region of the paranasal sinuses. They necessitate early plastic repair to prevent intracranial infection.

The authors still consider the main factor in the treatment of the acute closed craniocerebral injury to be careful management of the respiration, blood circulation, and electrolyte balance.

—*George Perret, M.D.*

Facial Palsy. Terence Cawthorne and D. R. Haynes. *Brit. M. J.*, 1956, 2: 1197.

Based on records of 557 cases of isolated nuclear or infranuclear facial palsy, the authors present an excellent discussion of the anatomic, and therapeutic problems involved and of the etiologic factors producing facial paralysis. The frequency of facial palsy is attributed to the long and tortuous course of the facial nerve through a small canal in the temporal bone. The facial nerve, its blood and lymphatic vessels, and its sheath fill the over-30 millimeter-long fallopian canal which does not provide room for expansion. Any swelling of the nerve or of its sheath is apt to squeeze the blood vessels and cause ischemia, which in turn encourages the original swelling of the nerve and may become sufficient to cause a block in the conduction of impulses.

The close relationship of the nerve to the various parts of the auditory apparatus is also responsible for its involvement in diseases or/and injuries of the ear. Injury accounted for 84, or nearly 50 per cent, of the total cases of facial palsy. In half of these damage was inflicted during the course of operation on the mastoid. Head injury with skull fracture accounted for 16 cases, and in 7 of the patients who were submitted to operation a fracture line was found running through the facial canal. The nerve itself was torn in 2 of the patients and badly bruised in 5. Apparently no instances were reported of nerve damage inflicted during the course of operation on the parotid gland.

In 39 patients the lesion was believed to be in the region of the geniculate ganglion, as the paralysis was associated with impaired lacrimation and loss of taste. Some of these patients had an associated herpes on the pinna and the neck, partial deafness, and vertigo.

The extension of a chronic infective process in the middle ear or the labyrinth by erosion into the Fallopian canal was found in 27 patients. Primary cholesteatoma or intratemporal dermoid was characterized by gradual onset of the paralysis in 12 patients. The facial palsy was caused twice by a neurofibroma of the facial nerve trunk and once by a tumor of the glomus jugularis. Palsy also may be due to malignant tumors of the parotid gland or the temporal bone.

Twenty-one cases of clonic facial spasm have been included in this series because this condition usually is accompanied by some slight paresis. Thirteen of these patients were submitted to decompression, but in none was any lesion noticed within the Fallopian canal. Guarded trauma to the nerve was followed by paresis for a few weeks and cessation of spasm. In a few patients the spasm was relieved for more than 18 months, but in many it had returned within that period. The authors also suggest deliberately cutting the nerve trunk in the Fallopian canal and then allowing it to regenerate. A nuclear type of facial palsy was encountered in 11 patients who had disseminated sclerosis and poliomyelitis. The palsy was not accompanied by loss of taste or loss of lacrimation.

The largest group, which consisted of 347 patients (62 per cent), had Bell's palsy. This series included only 2 patients with a bilateral condition, though in 33 patients there had been more than one attack. The authors believe that constriction of the nerve just above the stylomastoid foramen and swelling of the nerve trunk above the constriction was responsible for the paralysis. In nearly all of the 110 patients with Bell's palsy who were submitted to decompression, there was an obvious lesion localized to one small segment of the nerve trunk and almost always in the descending portion.

The prognosis for patients with Bell's palsy depends on the completeness of the paralysis. When the palsy was complete the chance of full recovery was 42 per cent; when it was incomplete the chance of recovery was 85 per cent. Of the patients who had complete palsy 6 per cent showed no sign of recovery after 6

months. Three weeks after the onset of the paralysis, the electrical activity of the nerve is a good index of the severity of the lesion and may help in the prognosis. When there is a normal response to electrical stimulation, the expectation of full recovery is 94 per cent. On the other hand, if the nerve does not respond to electrical stimulation, then the chance of full recovery drops to as low as 7 per cent. The indication for operative procedure depends upon the response to electrical stimulation. Decompression of the nerve in the descending part of the Fallopian canal is indicated when there is no response to electrical stimulation. The surgical procedure is not described. Of the 110 patients who had decompression for Bell's palsy, good results were obtained in 86, fair in 21, and poor in 3.

The authors also recommend support, electrical stimulation, and massage of the paralyzed muscles as supportive measures that may maintain tone in the muscles. By testing the ability of a patient with facial palsy to taste and to lacrimate, it is often possible to differentiate between a lesion near the stylomastoid foramen and one at the geniculate ganglion or in the nucleus. Taste is often lost in Bell's palsy and in lesions of the geniculate ganglion, but it is normal in nuclear lesions. Lacrimation is normal in Bell's palsy, lost in a lesion of the geniculate ganglion, and normal in nuclear lesion. The authors suggest that, in patients with facial palsy whose nerve is electrically dead, an attempt should be made whenever it is surgically practicable to explore the nerve at the site of the lesion as soon as possible. —*George Perret, M.D.*

Primary Tumors of the Trigeminal Nerve. JAAKKO S. TOLA. *Acta chir. scand.*, 1956, 111: 370.

THE AUTHOR presents 2 poorly documented cases of neurinomas which involved the trigeminal nerve. One patient had the signs and symptoms of a right cerebellopontine angle tumor associated with numbness of the right side of the face but without pain. The other patient had attacks of pain with sensory disturbances that involved the lower right side of the face. Unfortunately, the description of the symptoms, signs, and operative findings appears inaccurate and is too brief. In the first case the tumor may have arisen from the sheath of the trigeminal nerve root. In the second case the tumor was found firmly attached to the branches of the fifth nerve. The author then concludes that the lack of facial pain suggests a neurinoma of the sensory root. —*George Perret, M.D.*

SPINAL CORD AND ITS COVERINGS

Tumors of the Spinal Cord; Occurrence in Patients with Pernicious Anemia and Subacute Combined Sclerosis. DAVID G. HANLON, HENRY W. DODGE, JR., ROBERT G. SIEKERT, and FRANCES E. BULL. *J. Am. M. Ass.*, 1956, 162: 707.

THE NEUROLOGICAL CHANGES that may accompany pernicious anemia are well known. The lesions usually develop in both the posterior and lateral columns of the spinal cord. In addition, definite alterations may be observed in the peripheral nerves, and in a few instances cerebral involvement with mental symptoms.

Most physicians experienced in the care of patients afflicted with pernicious anemia hold that both the hematological and neurological manifestations of the disease can be treated effectively with adequate amounts of either a potent liver extract or cyanocobalamin, if these preparations are given intramuscularly. Common experience also indicates that the progress of the neurological symptoms that result from alterations in the spinal cord can be arrested in most, if not all, patients by such optimal parenteral therapy.

At the Mayo Clinic 2 patients were seen who had pernicious anemia and who showed initial improvement, but later showed progression in their neurological difficulties although they were following adequate maintenance programs. The results of the neurological examinations suggested the presence of focal lesions in the spinal cord. Both patients had tumors of the spinal canal.

The cases illustrate certain problems in the diagnosis and management of patients who have pernicious anemia with subacute combined sclerosis and tumors of the spinal cord. In both, the history was compatible with a diagnosis of subacute combined sclerosis of the cord with improvement on adequate therapy. It is emphasized that the progress of subacute combined degeneration in pernicious anemia can be arrested in every case by adequate parenteral therapy with either cyanocobalamin or a potent liver extract.

If, in spite of an adequate maintenance program with these agents, the number and severity of the neurological symptoms or signs increase, or if the neurological symptoms recur after initial improvement in spite of continuous adequate therapy, some cause other than pernicious anemia should be suspected. Neurological and neurosurgical consultation should be obtained in all such cases and appropriate studies should be carried out. The test with radioactive cobalt-labeled cyanocobalamin is useful in confirming the diagnosis of pernicious anemia in cases of remission due to previous parenteral therapy with liver extract or cyanocobalamin.

The Treatment of Large Nerves at the Time of Amputation of an Extremity; a Probable Cause for Persistent Pain. LOUIS G. HERRMANN and CLAUDE G. BOLLACK. *Am. Surgeon*, 1956, 22: 696.

THE AUTHORS, in attempting to assess the cause of persistent pain after amputation of an extremity, note that such pain responds very poorly to traditional therapy. They review the various methods of handling the proximal end of the severed large nerves in the amputated stump and critically discuss the reports of techniques published from 1908 to the present. Laboratory studies by their group reveal that the majority of these techniques are unsatisfactory, chiefly in preventing rupture of the neurilemma sheath with subsequent regeneration of axones and neuroma formation.

They conclude that ligatures must be applied first to the proximal end of the nerve just tightly enough to control bleeding from the nutrient artery and to create a mild pressure necrosis of nerve tissues beneath the ligature. Absorbable ligatures were found to loosen before complete healing of the end of the nerve had taken place, and therefore were unsatisfactory. The best results were obtained by the application of a nonabsorbable ligature about the uninjured nerve trunk

at a point about 1 inch above the end of the amputation. This ligature must be tied down gently to prevent rupture of the epineurium. Careful injections of 1 cubic centimeter of formaldehyde into the proximal end of the nerve immediately before the application of the ligature seems to add to the primary degeneration of the neurons and to the prevention of neuroma formation. The authors believe that such a technique is the most certain way of preventing persistent stump or phantom limb pain after amputation.

—*Edward B. Schlesinger, M.D.*

MISCELLANEOUS

The Fourth Neuroradiologic Symposium. James Bull, Donald L. McRae, H. H. Jacobsen, Fritz Cramer, and Others. *Acta radiol.*, Stockh., 1956, 46: 1–262.

This 498 page report of the fourth neuroradiologic symposium held in London, from September 13 to 17, 1955, was contributed to by radiologists, neurologists, and neurosurgeons from Europe, Algeria, Canada, and the United States. The subjects covered include radiologic methods of study of the vertebral column and skull, pneumography of the entire cerebrospinal axis, tentorial herniation, intracranial hemorrhage, the various techniques and interpretive skills in cerebral angiography, stereotaxy of the head, and the isotopes in neuroradiologic diagnosis.

In this report one finds many new techniques, as well as those of recent origin which are undergoing development. Simultaneous biplane stereoscopy, total cerebral angiography by rapid intravenous injection, the increasing use of cerebral phlebograms, newer and more accurate methods for rapid cerebral angiography, cerebral cineangiography, stereotaxic investigation of both the normal and pathologic brain, together with the therapeutic application of the stereotome, and the value of pneumography in the study of cisternal and upper spinal subarachnoid lesions are discussed. The individual papers are for the most part rather brief, so that detail as to method and interpretation of procedure is lacking. However, the report accents the rapid strides which neuroradiology as a subspecialty is making, and it stresses the importance and effectiveness of co-operation between the neurologist and the neurologically minded radiologist. —*John Martin, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Carcinoma of the Male Breast; Review of 36 Cases. JOHN H. MOHARDT. *Q. Bull. Northwest. Univ. M. School.*, 1956, 30: 315.

THE RELATIVE infrequency of cancer of the male breast, its poor prognosis, and the advanced state in which it is usually encountered prompted a review of 36 cases from the files of the Veterans' Administration Hospital, Hines, Illinois. The incidence varies little among various reports, and, according to Neal, 1.24 per cent of all cancers of the breast occurred in males in a series of 9,279 specimens.

The youngest patient in the Hines Hospital series was 26 years of age, and the oldest was 79. Sachs reports the disease in a 12 year old, and Wainright in one 1 year old. The average age in our group was 53.2 years. The majority of the cases occurred in the fifth and sixth decades, representing 64 per cent of the patients. Of the 36 patients 8 were Negroes (22.2 per cent). In view of the relatively small series, this percentage may have little significance regarding the racial distribution of mammary cancer in the male.

Gynecomastia is a commonly investigated lesion and considered to be precancerous; however, no instance of pre-existing or coexisting gynecomastia was recorded in this series. Gynecomastia results from estrogen activity and could be a predisposing factor. The hormone influence is generally considered to be an important etiologic factor in the development of cancer of the male breast. Since 1941 the use of estrogens in patients with carcinoma of the prostate has become quite universal, and there are many reports attesting to its value and the side effects induced in humans. The clinical criterion for the assimilation of this estrogen is its effect on the nipple and the breast which early become tender and hypertrophic. The analysis of this series fails to present definite evidence of such a relationship; however, 5 patients had abnormality in their endocrine glands or gland under endocrine control.

The first and most common finding was a tumor present somewhere between 3 months and 3 years and varying in size from a few millimeters to 10 centimeters or more in diameter. The tumor, originally freely movable, became attached to the skin, nipple, and the bony structures of the thoracic cage. In the advanced cases the patient felt a second mass in the axilla or lumps on one or both sides of the neck. Ulceration of the skin or nipple, observed in 11 of our cases, varied in size from a few millimeters to 20 or more centimeters in diameter. Retraction of the overlying skin, bleeding, loss of weight, anemia, and cachexia in the terminal stages were observed. In one patient pronounced lymphedema of the ipsilateral arm and hand was present, and in another hemiplegia, resulting from cerebral involvement with metastases, was noted. The most common finding was a progressive anemia reaching a severe degree in advanced cases and associated with a decrease in serum proteins. In 2 cases of disseminated bony metastases the serum calcium, phosphorus, and acid and alkaline phosphatase remained within normal limits. In one instance of extensive metastatic involvement of the liver the icteric index reached a height of 201 units.

The treatment during a period of many years consisted of simple mastectomy or radical mastectomy, with or without radiation, depending upon the extent of the lesion, metastases, associated disease, and the general condition of the patient.

This review of 36 cases of cancer of the male breast confirms the conclusions of others that the clinical and pathologic features of this tumor are similar to carcinoma of the breast in general. There is no evidence that this is a more malignant tumor than that found in the female; the principles of treatment are identical, and yet the results remain very poor.

The factors considered to be of significance are the anatomy of the male breast and the advanced stage of the lesion at the first examination. Cancer of the male breast occurs most commonly in the nipple region which contains erectile tissue, a rich blood supply, and a lymph vascular system, thereby permitting early painless dissemination. The scarcity of tissues, vestigial in type, favors early invasion of the adjacent structures. Of 36 patients, 11 had ulceration of the primary lesion, and the overlying skin or nipple was retracted 8 times. In the female the neoplasm must penetrate a deeper, larger layer of fat and mammary and connective tissue before extension to the adjacent structures.

The Treatment of Carcinoma of the Breast. ROBERT MCWHIRTER. *Irish J. M. Sc.*, 1956, 6th Ser.: 475.

THE CONFUSION that exists in the world today regarding the best method of treating carcinoma of the breast is due to a failure to follow uniform standards of radiotherapy and to variable criteria for operability when surgery is concerned. The degree of selection of patients for operation cannot be properly evaluated unless the total number of patients referred to the hospital are considered. Taking Edinburgh as a population unit of just over one million, McWhirter attempted to record all the cases of carcinoma of the breast which occurred during the period from 1941 to 1949. A total of 2,507 cases were collected, and of these 58 per cent were judged operable by the author's standards.

The author's method of treating operable patients consists of a total irradiating dose of not less than 3,750 roentgens administered to the supraclavicular, internal mammary, and axillary regions in a period of 3 weeks. Since this dose is not considered cancericidal in the breast itself, a preliminary simple mastectomy is performed. This method is contraindicated in obese patients in whom an adequate dose of x-rays cannot reach the axillary nodes. Nor is it recommended in the presence of gross peripheral vascular disease in which irradiation might further reduce the blood supply to the arm. When simple mastectomy

would involve transection of a primary tumor in the axillary portion of the breast, radical mastectomy is also preferred. The author's 5 and 10 year survival rates on all patients in the operable category, presuming all deaths were due to cancer, are 58 and 39 per cent respectively. When analysis is limited to those under 70 years of age at the time of the analysis, the 5 year crude survival rate becomes 60 per cent and the 10 year rate rises to 45 per cent.

Of the 36 patients with carcinoma of the breast, without distant metastases, and with associated pregnancy and lactation who were treated with simple mastectomy and radiotherapy, 14 or 39 per cent survived 5 years. In a small series of 17 men who did not have distant metastases, the 5 year survival rate was 29 per cent.

In the group not considered operable because of locally advanced lesions but free of distant metastases, simple mastectomy was not done in some instances. However, with radiotherapy a 30 per cent 5 year crude survival rate was obtained in this group. Seventeen per cent of the patients with palpable supraclavicular nodes in the locally advanced category survived 5 years.

Basing his information on operative findings prior to 1941, the author estimates axillary nodes to be involved in 60 per cent of the operable group. Wangensteen and others have shown that, when axillary nodes are involved, the supraclavicular and internal mammary nodes are involved in 60 per cent of the cases. The author, therefore, believes that the only disputed group as far as treatment is concerned is that with nodal involvement confined to the axilla (14 per cent of the total); in this group he believes that his method is as effective as radical mastectomy. He found radical mastectomy to be effective in 37 per cent of the total cases in those without nodal involvement and those with nodal involvement confined to the axilla. Simple mastectomy and radiotherapy have a broader application and can be extended to all cases except those with distant metastases (86 per cent of the total).

The 5 year crude survival rate for the entire group of 2,507 patients, including 344 with distant metastases who were not treated, was 43 per cent.

—*George R. Holswade, M.D.*

Sarcoma of the Breast (I sarcomi della mammella). V. Pricolo. *Tumori*, Milano, 1956, 42: 710.

At the Milan Tumor Institute 3,500 malignant tumors of the female breast and 37 malignant tumors of the male breast were encountered in a period of 27 years. In this group there were 20 tumors classified as sarcomas, 19 in women and 1 in a man.

The authors present brief case histories of the 20 tumors and discuss the theories of origin and histopathological classification.

From the clinical point of view they believe that the majority of these tumors can be diagnosed as sarcomas on physical examination. They are usually large tumors which grow rapidly, readily involve the chest wall or skin, have a soft or rubbery rather than hard consistency, are frequently hemorrhagic or necrotic, and their overlying skin often has a bluish tint. Grossly they have been confused with giant fibroadenomas, cystosarcomas, lipomas, and traumatic hematomas. Axillary lymph node involvement is rare. Metastases are usually hemaotogenous rather than lymphatic.

Radical mastectomy with postoperative x-ray therapy is believed to be the treatment of choice, although the authors recognize that good results may be obtained by simple mastectomy or local resection. They had one 4 year survival after simple mastectomy and postoperative x-ray therapy.

In their series of 20 patients there were 4 that died, all with pulmonary metastases. There is a relatively high incidence of local recurrence after simple mastectomy.

—*George L. Nardi, M.D.*

Lymphosarcoma and Reticulosarcoma of the Breast (Linfosarcoma e reticolosarcoma della mammella). F. Bellini. *Tumori*, Milano, 1956, 42: 737.

The authors point out that in the United States lymphosarcomas and reticulosarcomas are both considered malignant lesions originating in connective tissue, while on the Continent a precise histological and morphological distinction is usually made. It is thought that lymphosarcoma generally has a more favorable prognosis, with possible long term survival after surgical and x-ray therapy. Reticulosarcoma is believed to have a much poorer prognosis.

Two clinical cases were reported, the first that of a 61 year old woman who was living and well 20 months after radical mastectomy and x-ray therapy for a lymphosarcoma of the breast. The second was that of a 29 year old woman who died 6 months after radical mastectomy and x-ray therapy for a reticulosarcoma of the breast.

—*George L. Nardi, M.D.*

TRACHEA, LUNGS, AND PLEURA

Further Experiences with the Method of Controlled Unilateral Pulmonary Artery Occlusion in the Study of Lung Function. Paul Nemir, Jr., H. H. Stone, H. R. Hawthorne, and T. N. Mackrell. *J. Thorac. Surg.*, 1956, 32: 562.

Since 1951 when Carlens and associates published the first report on controlled unilateral occlusion of the pulmonary artery in the dog and man by utilizing a double lumen, balloon-tipped cardiac catheter, several reports have been available and at the present time approximately 300 patients have been studied without serious accident.

The purpose of the present report is to give the results of the continuing experience with this method in an attempt to evaluate the present status of the studies.

Some 35 patients were studied with this method. A 125 centimeter, triple lumen cardiac catheter with recording lumina both proximal and distal to the balloon has been used recently. Catheterization of the right or left artery selectively has usually required from 10 minutes to 1 hour and 15 minutes. Heparin is not used. The femoral artery is cannulated once a cardiac catheter is in position and 4 channels of the PolyViso electromanometer are utilized; one for continuous electrocardiography, one for pulmonary artery pressures proximal to the balloon, one for pulmonary artery pressures distal to the balloon, and one for continuous femoral artery pressures. Occlusion of the corresponding main stem bronchus is no longer

performed because it provides no significant information.

Extrasystoles occur as the large 10.5 cardiac catheter impinges on the right ventricular wall, but they disappear upon moving the tip of the catheter. Inflation of the balloon with a 35 per cent solution of diodrast (6 to 10 cubic centimeters) is easily accomplished, although withdrawal is frequently difficult. An elevation of temperature within 1 to 3 hours after conclusion of the procedure has occurred in approximately 75 to 85 per cent of the patients. The temperature returned to normal in almost all instances within 1 to 4 hours and has not been a serious complication.

A single major complication is reported in a 38 year old male admitted to the hospital with severe dyspnea and recurring bouts of cyanosis. Catheterization studies were felt to be consistent with severe mitral stenosis, and because of a history of exposure to beryllium and an elevated beryllium content in an intercostal pulmonary biopsy, berylliosis was also suspected. Twelve hours after catheterization the patient was found to have a right-sided hemiplegia and was thought to have had a cerebral vascular accident. He was given heparin and improvement gradually occurred in approximately 3 months. The patient enjoyed good function of the right leg, but the upper extremity remained impaired.

Particularly valuable studies were obtained with regard to the patient's ability to tolerate resection of pulmonary tissue in border line cases of respiratory function. Such studies may indicate the importance of doing a lobectomy rather than a pneumonectomy in carcinoma, if it is feasible, when there is evidence that the resection tolerance of the patient would be exceeded by pneumonectomy. Elevation of the resting pulmonary artery pressure, with a sustained increment following occlusion, has indicated a poor prognosis. The authors believe that their studies have also indicated that there are no precapillary anastomoses between the pulmonary and the systemic circulation.

—*Allan D. Callow, M.D.*

Experimental Studies on Bronchiectases in the Dog (Détermination expérimentale des bronchectasies chez le chien). JACQUES DELARUE and RENÉ ABELANET. *J. fr. méd. chir. thorac.*, 1956, 10: 453.

THE PROBLEM of pathogenesis of bronchiectasis in man has not yet been solved satisfactorily. The textbooks on pathology usually recognize two causative factors: mechanical distention of the bronchial wall, and chronic or repeated inflammations.

The authors believe that nervous and circulatory disturbances play an essential role in the genesis of bronchiectasis. To verify this theory they did experimental work on a series of 85 dogs. As spontaneous bronchiectasis does not occur in dogs, experiments that produce this condition artificially are of value.

A number of surgeons have reported a marked increase in the volume of the bronchial arteries and hypertrophy of the mediastinal and esophageal arteries in bronchiectasis. Innumerable abnormal anastomoses existed between the two arterial systems of the lung. As a consequence the blood in the pulmonary artery was arterial in some cases with an oxygen titer equal to that in the femoral artery. To imitate these circulatory conditions the authors performed the Blalock and the Potts operations in dogs, but no dilatation of the bronchi occurred.

The left pulmonary artery was ligated in 3 dogs and the animals were sacrificed after 100, 120, and 180 days, respectively. In another group a marked stenosis of the artery was produced by interrupted sutures. In some of these animals a ring of aluminum was fitted around the main bronchus in addition to stenosing of the pulmonary artery. In none of these experiments was dilatation of the bronchi found at autopsy.

In another group an area of 1 cm. length of the left main bronchus was swabbed under bronchoscopy with a 20 per cent solution of potassium hydroxide, or irritated mechanically by a gridlike metallic instrument. The cauterizations were repeated weekly and the animals sacrificed after 4 months. At autopsy typical bronchiectasis with atrophy of the wall was found in many secondary bronchi distal from the site of cauterization.

The histologic examination showed mucous hypersecretion of the epithelium, atrophy of the muscles and elastic tissue, atrophy of the cartilages, numerous dilated blood vessels, and abnormal anastomoses between the bronchial and pulmonary arteries, and the lung parenchyma showed scattered areas of hypertrophic reticulate pneumonia. No signs of superimposed infection were present in any of the cases; the bronchi contained only mucus with very few leucocytes.

A similar picture was found after mechanical irritation of the bronchus with the metallic apparatus. A number of bronchiectases developed distal to the site of irritation but in no other area of the lung.

The authors conclude from these experiences that infection, hypersecretion, and stasis are the sequelae rather than the cause of bronchiectasis.

In a last group of animals the authors studied the influence of the autonomic nervous system on the development of bronchiectasis because complete absence of ganglion cells in the peribronchial tissue has been observed in bronchiectasis. They destroyed the right vagosympathetic trunk in the cervical area by the injection of absolute alcohol. The animals were sacrificed from 60 to 180 days after the operation. Histologic examination revealed general dilatation of all the bronchi, atrophy of the wall, and disappearance of the peripheral ganglia. As in the dog the sympathetic and parasympathetic fibers course together in the same trunk, it was impossible to determine the exact nature of the disturbance from these experiments.

In summarizing, the authors state that it is possible to produce all the characteristics of human bronchiectasis in dogs by local irritation of the main bronchi without producing a stenosis. In addition to the dilatation of all the bronchi distal to the site of irritation there is a marked alteration of the wall which is identical to that observed in human pathology (hypersecretion of the epithelium and glands, and degeneration of the muscles and cartilage). Moreover, the authors were able to show that destruction of the autonomic nervous trunk caused general dilatation of the bronchi on the homolateral side. These experi-

ments refute the theory of the mechanical or the inflammatory genesis of bronchiectasis and confirm the authors' belief that disturbances in the circulatory and nervous systems play the decisive role.

—Werner M. Solmitz, M.D.

HEART AND PERICARDIUM

Heart Damage in Dogs Subjected to Hypothermia, Circulatory Arrest, and Cardiac Surgery. H. S. Samuli Sarajas, Ake Senning, and Jorge Kaplan. *Am. Heart J.*, 1956, 52: 836.

This article, from the Sabbatsberg Hospital in Stockholm, discusses some of the pertinent aspects of hypothermia as it relates to cellular damage in the myocardium and pericardium. In a previous report, one of the authors (Sarajas) presented gross and histologic evidence for myocardial damage in dogs subjected to hypothermia. Degenerative and early necrobiotic changes in the myocardium could be detected in dogs dying of the effects of deep hypothermia, or at autopsies after the termination of moderate (26 to 27.5 degrees C.) hypothermia of 1 to 4 hours' duration. In addition, myocardial areas of necrosis could be detected which, in accordance with the length of survival of the animals, showed different stages of development and healing. These results corroborated previous introductory studies by Sarajas and Nilsson, which suggested that acutely induced hypothermia in dogs may seriously affect the heart muscle, as well as produce injurious effects upon the liver and the central nervous system.

The present study was undertaken to determine whether these necrobiotic changes would be made more severe by carrying out various surgical interventions upon the heart. Accordingly, observations were accomplished in dogs subjected to circulatory arrest, direct vision cardiac surgery, and cardiac resuscitation during the hypothermic state. In almost all of the 18 animals studied during this investigation, pericardial changes consisting of localized fibrinous pericarditis in various stages of development and healing were noted. In all but 2 animals concurrent morphologic changes in various layers of the myocardial wall, distant from the affected epicardium and the sutured wounds associated with cardiac surgery, were noted.

The mechanism of irreversible myocardial damage, as the result of hypothermia, probably results from focal disturbances in the myocardial blood or oxygen supply. Previous investigations revealed no direct evidence of thrombotic or embolic phenomena in the coronary vascular bed. More recently, it has been shown that during progressive cooling, an increasing aggregation of red cells is formed in the peripheral vascular bed, resulting ultimately in complete cessation of the capillary blood flow. It is also true that in hypothermia the blood pressure is markedly lowered, and the pressure within some terminal branches of the coronary vascular tree may fall below a critical level with resultant closure of the vascular lumens and subsequent patchy myocardial damage. This may occur particularly in the subendocardial compartments of the coronary vascular bed, which would explain the frequent incidence of the subendocardial injury pattern in the present studies.

The possible role of relative myocardial hypoxia remains to be solved. It has been suggested that in hypothermia there exists no failure in the myocardial oxygenation, but rather in the ability of the heart muscle to convert aerobic energy into useful work. This might hold true in the stable period of hypothermia. However, tachycardia, which frequently accompanies the early cooling period as well as the shock-like state of rewarming, may well give rise to relative myocardial hypoxia. When ventricular fibrillation, with associated coronary circulatory arrest, is sustained for longer periods, the heart muscle is probably suffering from hypoxia.

Focal areas of injury in the myocardial wall naturally result in loss of the functioning muscle units. When extensive enough or diffusely distributed, such patchy lesions may seriously impair myocardial efficiency. This may cause fatal cardiac failure even without the contribution of coexisting disturbances in the cardiac rhythm. On the other hand, areas of myocardial injury may initiate conduction disturbances, premature beats, and ventricular fibrillation, known to appear and result in fatal termination during the process of cooling or rewarming. These mechanisms may contribute to each other, and in the presence of any additional stress to the heart, such as surgical trauma and the alterations in various physiologic equilibria known to accompany the cooling and rewarming process, there exist predisposing conditions for supervention of fatal cardiac failure. The pericardial damage, as seen in the animals in this present experiment, is apparently of lesser functional significance.

The results reported here, as well as the earlier observations, tend to substantiate the assumption that some pathologic cardiac changes may cause or contribute to the fatal termination occurring with varying frequency in association with experimental hypothermia that is complicated or uncomplicated by cardiac surgery. Whether or not the same pattern of pathologic cardiac changes occurs in human beings subjected to similar surgical procedures is not known at present.

—Orville F. Grimes, M.D.

Anatomic and Pathologic Studies in Ventricular Septal Defect. Luis M. Becu, Robert S. Fontana, James W. DuShane, John W. Kirklin, and Others. *Circulation*, 1956, 14: 349.

A survey was made at the Mayo Clinic of 50 cases in which the hearts had ventricular septal defects studied at necropsy. This anomaly was the only cardiovascular malformation in 34 patients (group A); 1 or more cardiovascular malformations were associated with the ventricular septal defect in the remaining 16 patients (group B); but together these did not form traditionally recognized complexes.

Of the 19 patients of group A in whom death was related to the ventricular septal defect, 12 were less than 1 year of age at the time of death, and each of these 12 died of predominantly left ventricular failure. Bacterial endocarditis and predominantly right ventricular failure were the principal causes of death in the patients who died beyond the period of infancy.

Among the 16 patients in group B, 13 were considered to have died of the cardiovascular malformations. Eight patients were less than 1 year of age at

the time of death: 6 of them died of left ventricular failure, and 2 of right ventricular failure.

Commonly associated cardiovascular malformations included atrial septal defect (4 cases), obstructive disease of the aortic arch (5 cases), patent ductus arteriosus (5 cases), and vascular rings (3 cases).

The 2 oldest patients at the time of death were a 55 year old woman with only a ventricular septal defect and a 51 year old woman with a ventricular septal defect, a patent ductus arteriosus, and an anomalous insertion of the chordae tendineae with mitral insufficiency.

Each ventricular septal defect was classified according to the region of the ventricular septum it involved. By far the commonest type of defect was situated in the outflow regions of the ventricular septum.

Myxoma Cordis; Diagnosis Established Preoperatively; Surgical Removal of the Tumor. F. S. P. VAN BUCHEM and L. D. EERLAND. *Dis. Chest*, 1957, 31: 61.

ALTHOUGH MYXOMAS of the heart are rare, they constitute 50 per cent of all primary tumors of the heart. Twenty-five per cent of the myxomas are located in the right atrium and 75 per cent occur in the left atrium. The majority are attached by a pedicle to the auricular wall in the region of the foramen ovale.

Dyspnea on exertion is an early complaint, and acute dyspnea, precordial pain, or fainting may occur with sudden changes in body position. No murmurs are heard in some patients, while in others there may be a systolic murmur in the supine position and a diastolic murmur in the sitting position. The mistaken diagnosis of mitral stenosis is often made. Peripheral systemic emboli may occur and sometimes prove fatal. Cardiac decompensation is usually progressive and the response to digitalis and diuretics is not as satisfactory as in mitral stenosis.

Cardiac catheterization shows elevated pressures in the right ventricle and pulmonary artery similar to those seen in mitral stenosis. The correct diagnosis is established by the demonstration of a filling defect in the atrium by angiocardiography.

The authors report a case of myxoma of the left atrium in a 45 year old man who had suffered rapid progression of symptoms. Clinical evidence pointed toward the diagnosis which was confirmed by angiocardiography. It was originally planned to remove the tumor under hypothermia. However, early in the process of immersion cooling, when the temperature had fallen only 1 degree, cardiac arrest occurred. The chest was opened and cardiac action restored by cardiac massage. Without attempting to lower the temperature further a 6.5 by 4 by 5 centimeter polypoid tumor was removed transatrially. The tumor was detached from the septum by means of a bare finger introduced through the appendage, and removed through a separate incision without loss of blood or the development of air embolism. Unfortunately ventricular fibrillation soon occurred and resuscitation was not successful. The authors believe that acidosis and hypopotassemia, undetected preoperatively, contributed to the cardiac arrest during the early stages of cooling and to the subsequent terminal ventricular fibrillation. —*George R. Holswade, M.D.*

Total Body Perfusion for Open Cardiotomy Utilizing the Bubble Oxygenator; Physiologic Responses in Man. RICHARD A. DEWALL, HERBERT E. WARDEN, VINCENT L. GOTT, RAYMOND C. READ, and Others. *J. Thorac. Surg.*, 1956, 32: 591.

UTILIZING a simple disposable bubble oxygenator, reported elsewhere, together with an extracorporeal pump, the authors have performed intracardiac reparative surgery under direct vision and totally bypassing the heart and lungs in 80 patients. These patients ranged in age from 4 weeks to 38 years and in weight from 2.6 to 56 kilograms.

The present report is an analysis of the physiologic responses of the first 60 of these patients to their interval of total cardiopulmonary bypass at various perfusions rates. Observations include acid-base alterations, oxygen consumption rates, effects upon the clotting mechanism, hemolysis, and arterial pressures. By intention they were perfused at rates of flow of from 26 to 60 cubic centimeters per kilograms of body weight per minute, so as to gain more objective data of optimal perfusion rates for human beings. The rate selected for a given patient was maintained throughout the procedure independent of occasional fluctuations of venous return by the addition of blood to the extracorporeal circuit as needed. Thus, responses of patients to a constant volume perfusion could be studied in relationship to the selected flow rate.

Total body perfusions often are characterized by the development of blood acid-base alterations, and consequently the attention of the authors is directed particularly toward determining what factors contributed to these variations. One hundred per cent oxygen was used in the oxygenator to arterialize the venous blood, and carbon dioxide was allowed to escape freely from the blood in the belief that respiratory alkalosis would tend to counterbalance to some extent the tendency toward the development of metabolic acidosis. Control blood samples were drawn just before perfusion and after a period of controlled respiration of the open chest. To facilitate comparison between the perfusion rates and the development of acid-base alterations, plasma bicarbonate concentrations (alkaline reserve) were determined. Values for *p*H alone are unreliable for a precise evaluation, since the acid-base balance may vary widely without direct reflections on the *p*H because of compensation by blood buffers. Acid-base changes during total body perfusion were measured in patients with acyanotic heart disease and in patients with a cyanotic heart disease. Lactic acid determinations and oxygen consumption rates were determined, as were determinations of the degree of hemolysis, variations in clotting mechanism, and measurements of pressure.

At all flow rates oxygenation of venous blood by this oxygenator was optimal (95 to 96 per cent). The carbon dioxide content of the arterial blood returning to the patient from the oxygenator was consistently less than the control of normal values, which indicated that this apparatus adequately removed the carbon dioxide of catabolism from the venous blood. Recent investigations have indicated that the principal humoral agent controlling the vasomotor tone of cerebral circulation in man is the arterial carbon dioxide

content. Depressed arterial carbon dioxide levels decrease and high levels increase cerebral blood flow. Cerebral oxygen consumption was unchanged by various concentrations of arterial carbon dioxide studied by other investigators. In spite of the observations that patients invariably awakened immediately after the anesthetic wore off, appeared mentally alert, and were free of evidence of neurologic sequelae, it is obviously important to study more precisely the effects of various flow rates and the various partial pressures of arterial carbon dioxide.

During total body perfusion a moderate plasma bicarbonate depression regularly occurred and was accompanied by moderate elevation of blood lactic acid. The values for *p*H did not vary greatly from normal. Serum potassium values regularly decreased moderately during perfusion. Changes in bicarbonate, lactic acid, and potassium, occurring during total body perfusion, are qualitatively and quanitatively similar to the changes observed during the administration of epinephrine in physiologic quantity, and it is believed that these changes in acid-base equilibria are the result of reflex stimulation of the sympathetic nervous system rather than of tissue hypoxia. Preoperatively, all patients with cyanotic heart disease were found to be in a state of metabolic acidosis under ambulatory conditions. The smaller and younger patients had higher oxygen consumption rates during the perfusion as they do in normal states, and, therefore, they should receive higher perfusion rates than older children and adults. Hemolysis of the blood during the perfusion was minimal. Platelet, bleeding, and clotting times were not greatly different in the preoperative and postoperative periods. —*Allan D. Callow, M.D.*

The Neurologic, Psychiatric, and Psychologic Aspects of Cardiac Surgery. WALTER S. PRIEST, MISHA S. ZAKS, GEORGE K. YACORZYNSKI, and BENJAMIN BOSHES. *Med. Clin. N. America*, 1957, 41: 155.

A HIGHER INCIDENCE of psychoses has been noted following cardiac operation than other types of major surgery. This fact led the authors to a careful evaluation of the neurologic, psychiatric, and psychologic features in 60 patients who were candidates for cardiac surgery. Forty-seven of these had rheumatic valvular heart disease, 9 had congenital lesions, and 4 had coronary artery disease. Cardiac surgery was performed in about half of the patients studied.

Neurologic examination was performed before and after operation in 16 patients with mitral stenosis. Only 1 patient, a known epileptic, had preoperative neurologic findings and these were unchanged by operation. Positive findings, however, were noted in 9 patients postoperatively, but in 6 of these the residual damage was not handicapping. There did not seem to be any definite correlation between the presence of atrial clots or calcified valves and the development of positive neurologic signs. Carotid artery compression did not prevent clinically demonstrable brain damage in 4 patients. Transitory signs were noted postoperatively in 2 patients who were operated under hypothermia, but cardiac standstill of 2 to 3 minutes had occurred in 1 of these patients.

Psychiatric evaluations were similar to the findings of other investigators in this group of patients, and greater attention is given to the results of a large number of psychometric tests. These tests were repeated 3 weeks following surgery, and again at 6 months, 1 year, and 2 years. All patients tested were found to have severe anxieties, the degree of which was greatest in those with rheumatic heart disease. The critical period from a psychiatric standpoint is during the first 2 to 3 weeks postoperatively, while from a psychologic point of view the critical period lasts up to 6 months. The tests indicate that there is a real basis for the immediate postoperative depressions and suicidal tendencies as well as for the milder behavior disorders.

Operation should be deferred on any patient showing acute psychotic or suicidal tendencies until he has had sufficient psychiatric treatment to enable him to undergo the stress of surgery. For the first 6 months following surgery the patient should be given special consideration and emotional support in order to facilitate rehabilitation.

Ideally, all patients who are to have cardiac surgery should have a psychiatric and psychologic evaluation. When this is not possible the clinician should make an effort to screen cardiac patients for emotional disturbances. —*George R. Holswade, M.D.*

Visual Intracardiac Surgery in a Series of 111 Patients. HENRY SWAN and S. GILBERT BLOUNT, JR. *J. Am. M. Ass.*, 1956, 162: 941.

HYPOTHERMIA is one of the methods used in the search to achieve the major goal of cardiac surgery—the open heart, a dry field, and direct vision. It is the authors' conviction that increasing experience will enable most, if not all, operative procedures within the heart to be accomplished under these conditions. In this article the authors analyze the results of the hypothermia method in 111 patients when combined with other variables such as new operative techniques for a large variety of congenital defects.

The time limit for open operations within the heart has been found to be 8 minutes at the most and 6 minutes preferably in hypothermia. The lowest range of body temperature utilized is between 29 and 32 degrees centigrade (84.2 to 89.6 degrees Fahrenheit). Lesions suitable for repair within the limits of this technique are, specifically, valvular and infundibular pulmonary stenosis (both with intact interventricular septum), secundum-type atrioseptal defect, and, more recently, aortic valvular stenosis. The lesion of the ventricular septal defect is beyond the scope of this technique at present. There are no rigid indications for operative intervention in patients with a valvular-pulmonary stenosis and an intact ventricular septum. These indications center upon results of physiologic studies and not upon the patient's symptoms. Therefore, cardiac catheterization is indicated in every such patient, not only to verify the clinical impression, but also to evaluate the significance of the lesion.

With experience, it has been found that the probable tolerance of the heart to surgery can be accurately predicted. Therefore, the operative mortality will be largely dependent on the selection of patients for operation. The risk without surgery in certain lesions is 100 per cent and, therefore, operation is believed to be indicated often in the desperately ill. The authors

stress the fact that avoidance of temperatures lower than those mentioned will largely eliminate two of the major complications: those of cardiac arrhythmia and disturbances in the clotting mechanism. The latter is also avoided by the use of fresh in preference to stored blood. —*Sheldon Oscar Burman, M.D.*

A Method for Controlled Cardiac Arrest as an Adjunct to Open Heart Surgery. W. GLENN YOUNG, JR., WILL C. SEALY, IVAN W. BROWN, JR., WILMER C. HEWITT, JR., and Others. *J. Thorac. Surg.*, 1956, 32: 604.

THE REPAIR of intracardiac defects which employs a pump-oxygenator is complicated by the loss of blood from the coronary sinus and regurgitation through the aortic valve. Occlusion of the ascending aorta prevents this difficulty, but is tolerated only briefly by the beating heart. Induced cardiac arrest provides a dry motionless operative field and permits longer periods of aortic occlusion.

By testing various concentrations and combinations of potassium citrate and magnesium sulfate on the isolated heart of the cat, the most satisfactory cardioplegic agent was found to be a solution containing 2.47 grams per cent magnesium sulfate and 0.54 grams per cent potassium citrate brought to a *p*H of 7.4 with sodium bicarbonate. This combination produced arrest with less apparent toxicity than when either potassium citrate or magnesium sulfate was used alone. The addition of prostigmin, 1 milligram per 100 milliliters of solution, seemed to decrease the incidence of ventricular fibrillation.

In a series of hypothermic dogs cardiac arrest was induced by the injection of the cardioplegic solution into the base of the occluded aorta. With both vena cavae occluded, right ventriculotomy was performed and repaired. The heart was restarted by flushing the coronary arteries with oxygenated Ringers' solution and in turn with oxygenated blood through a catheter in the subclavian artery. In a second series of similar experiments in normothermic dogs a pump-oxygenator was used. The heart was restarted easily by releasing the out-flow tourniquet and allowing oxygenated blood to flow through the coronary arteries. Although less than 50 per cent of the latter group were long term survivals, the authors were pleased with the low incidence of ventricular fibrillation when using this technique. Furthermore, the authors believe that the entire dose of cardioplegic solution would not produce serious complications should it escape into the general circulation.

This method of controlled cardiac arrest in conjunction with hypothermia was used on 2 patients. Normal heart action was resumed in both, but they failed to survive. —*George R. Holswade, M.D.*

Disposable Membrane Oxygenator (Heart-Lung Machine) and Its Use in Experimental Surgery. DONALD B. EFFLER, WILLEM J. KOLFF, LAURENCE K. GROVES, and F. MASON SONES, JR. *J. Thorac. Surg.*, 1956, 32: 620.

DURING THE EARLY USE of the rotating type of artificial kidney, it was noted that the dark blood entering the machine turned red during its course through the dializine tubing. This observation prompted the development of a simple disposable oxygenator based on the permeability of various membranes to both oxygen and carbon dioxide.

The artificial lung unit consists of 2 tubes of polyethylene, 1/1,000 of an inch thick, wound around a tin can. Each tube is 2 inches wide and 7 meters long. Interposed plastic-coated fiberglass screen and spacers provide space for filling with blood and circulation of oxygen. The unit is enclosed in a plastic bag through which warm oxygen is circulated. When blood flows through the tubes a 14,000 square centimeter oxygenating area is available, and the unit will oxygenate 75 milliliters of blood per minute; 270 milliliters of blood are required to prime each unit. To obtain higher rates of flow as many as 10 units may be used in parallel. Sigmamotor pumps are used on the arterial and venous sides of the apparatus, with a third pump maintaining a constant flow through the artificial lungs. The arterial pump was usually set at a rate of 35 milliliters per kilograms of body weight per minute.

In 140 experiments on dogs various observations were made. Hemolysis was less than 20 milligrams per hundred milliliters, even though as many as 4 dogs were often run in 1 day with the same blood in the machine. The oxygen saturation of arterial blood was over 90 per cent. Metabolic acidosis was combated by the use of a continuous drip of sodium bicarbonate (14.5 milliequivalents per kilograms of body weight diluted to 100 milliliters with 5 per cent fructose in water) during the run and by additional sodium bicarbonate administration in the immediate postoperative period. It was found that when the heparin, used as an anticoagulant, was adequately neutralized with protamine, only transient changes occurred in the clotting mechanism, and in general hemorrhage was no great problem.

The advantages of this technique are the elimination of the hazard of air embolism and the freedom from hemorrhagic diathesis. The chief disadvantage is the necessity for multiple units, with resultant large priming volumes when high flow rates are desired.
—*George R. Holswade, M.D.*

Total Resection of the Aortic Arch. OSCAR CREECH, JR., MICHAEL E. DEBAKEY, and DANIEL E. MAHAFFEY. *Surgery*, 1956, 40: 817.

THE PROBLEMS INHERENT in total resection of the aortic arch which have delayed this phase of arterial surgery are related to ischemic changes in the central nervous system and serious left ventricular strain from clamping of the proximal aortic arch. To overcome these dangers, temporary shunts have been devised to exclude the entire aortic arch without appreciable effect on the cerebral blood flow or cardiac output.

A review of previous reported cases utilizing this principle with variously sized shunts is presented. In all cases death resulted with evidence of damage to the central nervous system.

This report presents in detail 2 cases in which total aortic arch resection and replacement were performed with no apparent damage to the central nervous system, although both patients died postoperatively.

The first case was a relatively small aneurysm of the arch, involving principally its inferior surface. These

two factors made it possible to "walk" the graft into place after a shunt was made which diverted the blood from the ascending to the descending aorta. While the excluded proximal anastomosis of the graft was being accomplished the cerebral blood flow was maintained by a flow via the shunt and retrograde up the descending aorta. While the distal anastomosis was being completed the cerebral flow was maintained by the newly placed proximal graft. Death in this case was apparently due to postoperative atelectasis and cardiac arrest. Surgery had been performed under hypothermia.

The second patient had a large aneurysm which precluded the procedure used in the first case because removal of the aneurysm was necessary before implantation of the homograft was begun. In this case hypothermia was not used and a larger (20 mm.) shunt was so placed that it was on the periphery of the operative field, allowing free access to both the aneurysm and the branches of the arch. The posterior branches of the shunt were anastomosed to the side of the innominate and left carotid arteries to maintain the cerebral blood flow during the excision of the aneurysm. Once excised, the graft was placed beginning with an anastomosis of the innominate artery and followed by that of the ascending aorta, left carotid, and the subclavian and descending aorta. The shunt was removed with the aid of exclusion clamps. Postoperatively, the patient exhibited no central nervous system signs, but succumbed to a staphylococcus wound infection which involved the anastomosis, on the eleventh postoperative day.

The authors point out that both techniques for bypassing the arch are practical and effective. They feel that hypothermia is not necessary if a bypass shunt of 20 mm. or more is used and if there is no interruption of the carotid blood flow.

They also point out the impairment of ventilatory capacity by the extensive thoracic incisions and the oft-injured phrenic nerve, and stress the necessity for prophylactic postoperative care in this regard.

—Arthur M. Simpson, M.D.

ESOPHAGUS AND MEDIASTINUM

Granulomas of the Mediastinum (Les granulomes du médiastin). A. Balmes, E. Nègre, and A. Thevenet. *Presse. méd.*, 1956, 64: 1742.

The case here reported was that of a 55 year old man who two months previously had an attack of dyspnea followed by violent coughing and sanguineous expectoration. On examination cyanosis of the face with dilatation of the jugular vein and some evidence of collateral circulation over the upper thoracic region were noted. The patient stated that the congestive condition of his face was getting worse.

Roentgenologic examination disclosed a rounded, nonhomogeneous opacity with rather well defined borders in contact with the trachea in the anterosuperior region of the right mediastinum. Pneumomediastinum by the retroxyphoid route showed that diffusion of the air about the mass was incomplete. Marginal and central calcified areas were demonstrated. The diagnosis was dermoid cyst of the mediastinum.

At operation an orange sized tumor was exposed in the right tracheobronchial angle, pushing the superior vena cava anteriorly and compressing it. Palpation of the mass disclosed a thin capsular wall, in places calcified, and with a thick, puttylike content. It was firmly adherent on its medial aspect to the superior vena cava, and on its inferior aspect to the azygos vein. The latter was ligated and removed with the tumor. Removal was rendered difficult because of the adhesions; during the procedure the wall was lacerated and the contents of the tumor removed with the curet. A part of the tumor wall, 2 sq. cm. in area, was adherent to the vena cava and could not be removed. This area was thoroughly curetted.

The wound was closed with drainage through the seventh costal interspace. Six months later the patient was in excellent health.

The cyst was not lined with epithelium; its content was of a lipid-calcareous character. The inner layers of the wall were composed of dense connective tissue without evidence of fibroblastic response; the outer layers were composed of a vascular connective tissue. The Ziehl-Nielsen test and guinea pig tests were negative.

In view of the impossibility of a precise preoperative diagnosis and the possible development of grave complications the authors consider that surgical removal of these tumors is justified, although some workers have asserted that the tumors may regress spontaneously.

—John W. Brennan, M.D.

The Surgical Management of Congenital Esophageal Atresia (Ueber die chirurgische Behandlung der kongenitalen Oesophagusatresie). R. Berchtold and H. Hamelmann. *Schweiz. med. Wschr.*, 1956, 86: 1386.

This article is based on the authors' experience with 15 cases of congenital esophageal atresia seen over the past 5 years. Nine of the patients were hospitalized under an incorrect diagnosis. Of the entire group, 12 were operated upon. Four of the infants who underwent surgery expired within the first 2 postoperative days. Two others died later on, one as a result of a breakdown of the esophageal anastomosis and the other from peritonitis secondary to the breakdown of a gastrostomy. One child succumbed 8 weeks after operation because of a stenosis of the aortic isthmus. Four of the patients operated upon are alive and well (2 months to 3 years after their operations).

Under Vogt's classification, 14 infants had the 3b malformation, i.e., the upper esophageal segment ended blindly while the lower one had a fistulous communication with the trachea. This conforms to other series in which this type was seen in 90 per cent of the patients.

One child had the type 2 abnormality, i.e., two esophageal segments with no communication with the trachea. In the type 3b abnormality the following signs and symptoms should suggest the diagnosis: a profuse flow of saliva from the mouth following birth, the choking and coughing up of foamy mucus shortly after birth, an increase in coughing and choking after an attempt to feed the infant, and a loud tympanitic note on percussion of the epigastrium. The presence of the following should establish the diagnosis: the inability to pass a catheter down the esophagus beyond

the 10 centimeter level, the x-ray demonstration of the tip of the catheter at the level of the jugular notch, and the filling of the distal esophagus and remainder of the gastrointestinal tract with air. The use of an absorbable contrast medium to demonstrate the blind proximal esophageal pouch is also confirmatory. Once the diagnosis is established, surgery must be planned for.

The presence of other congenital abnormalities must be recognized; about one-fourth of the infants have associated anomalies and 4 of the infants in this series fell into this category. There was a transposition with an No. IV septal defect, a patent ductus, a total stenosis of the isthmus, and an anal atresia. Aspiration pneumonitis and atelectasis should be effectively controlled before surgery is performed and only a delay of not more than 36 hours is permitted in order to bring the child into proper condition.

The authors then review the operative technique and postoperative care, which has been suggested in the current literature and which they have employed.

—*J. C. Rosenberg, M.D.*

The Surgical Management of the Complications of Reflux Esophagitis. F. Henry Ellis, Jr., Howard A. Andersen, and O. Theron Clagett. *Arch. Surg.*, 1956, 73: 578.

Attention has been drawn again to the problem of reflux esophagitis, particularly as it concerns the surgeon. The operative procedures that have been suggested in the management of this disease are briefly discussed.

A total of 45 patients with complications of reflux esophagitis have undergone operation at the Mayo Clinic in the past 10 years. The cause of the esophagitis was esophageal hiatal hernias in 27 patients, excision or destruction of the cardial sphincter in 10, and vomiting, either postoperative or secondary to obstructive duodenal ulcers, in 6. Two patients had incompetent cardias in the absence of other demonstrable disease. Indications for operation were esophageal obstruction in 20 patients, intractable pain in 17, and hemorrhage in 8.

A number of operative procedures were employed, including esophagogastrectomy of various types and subtotal gastric resection. Eighteen (46 per cent) of 39 patients who were followed up had good results.

Dissatisfaction with the results of conventional surgical measures has led to trial of a new operative procedure, which includes excision of the lower part of the esophagus and the cardia, bilateral vagotomy, and excision of the lower part of the stomach, including the antrum. The proximal part of the stomach is anastomosed to the esophagus and the distal end to the duodenum. The short-term results in the 9 patients so treated have been encouraging.

Ligation of Esophageal Varices by the Transabdominal Route. C. Stuart Welch. *N. England J. M.*, 1956, 255: 677.

The importance of early interruption of bleeding from esophageal varices is stressed. Exsanguination is a real danger, and the absorption of nitrogenous products following massive hemorrhage leads to ammonia intoxication and hepatic coma.

Immediate control of bleeding can be accomplished by tamponade with a tube of the Sengstaken-Blakemore type. By such an expedient blood loss can be replaced, and the fluid and electrolyte imbalance corrected. Bleeding often recurs after discontinuance of the tube, and for this reason surgical ligation of varices is necessary.

Transthoracic approach for ligation of esophageal varices has been reported with fair success. The author suggests the abdominal approach, pointing out the lesser magnitude of such a procedure, which also has the advantage of being in a familiar field for the average surgeon. There is a reduction in the operating time and pulmonary function is less affected. The abdominal approach also affords an opportunity to deal with coexisting gastric and duodenal lesions. This last point is especially important if the diagnosis is in doubt preoperatively.

The procedure is carried out as soon as the blood volume and the major electrolyte and fluid imbalance is corrected. Bromsulfalein tests can be performed to give additional information; however, such examinations as barium swallow or esophagoscopy are not considered necessary. Also a trial of conservative management after tamponade is believed to be unwise.

The abdomen is entered through an upper midline incision with the tube in place and bag inflated. The cardioesophageal junction is mobilized and the esophagus brought down through the hiatus of the diaphragm in a manner similar to that used in vagotomy. No difficulty is encountered because of the size of the liver. The lower esophagus and upper stomach is opened, and after deflation of the bag the varices are lighted with a running lockstitch of No. 000 chromic catgut. After a test for evidence of further bleeding and after a sterile Levin tube is attached to the distal tip to provide postoperative intubation, the Sengstaken-Blakemore tube is withdrawn. The esophageal and gastric incisions are closed in the conventional manner.

Three of 5 patients treated in this manner died postoperatively. In each instance the patient was considered a poor risk. The author believes that early operation will increase the survival even in this poor risk group; however, in certain percentage of cases hemorrhage represents the terminal phase of a far advanced process. Coma is not considered a contraindication, since the cessation of bleeding affects this problem favorably.

Bleeding was controlled in each of the 5 patients treated. Ligation should be undertaken in all cases of bleeding esophageal varices except in patients with severe hepatic insufficiency. The procedure serves as a temporary expedient, and definitive shunting operations should follow when maximum recovery is obtained.

—*M. C. Anderson, M.D.*

MISCELLANEOUS

Right Diaphragmatic Eventration (La eventratio diaframmatica destra). G. Fojanini and G. F. Monti. *Arch. ital. chir.*, 1956, 81: 285.

The authors report 13 cases of right diaphragmatic eventration.

The cases were divided into three groups; the first group comprised the cases of total eventration. This lesion may be congenital or acquired. Histologically, it is characterized by a scarcity of muscular fibers; they can even be absent, but fibrous tissues are the predominating factor. The acquired form of eventration is secondary to pleuropulmonary diseases or lesions of the phrenic nerve.

In the second group the right diaphragmatic eventration was frequently localized in the anterior and medial portion of the right hemidiaphragm; this eventration also may be congenital or acquired.

The third group comprised the cases of partial eventration accompanied by particular morphological alteration of the liver.

The diagnosis of this affection is essentially radiological, particularly in association with previous pneumoperitoneum. Plastic and prosthetic surgical methods have been used successfully in the repair of right diaphragmatic eventrations.

—*Mariano Lopez Belio, M.D.*

A Consideration of Proper Methods in Thoracic Anesthesia. E. M. Papper and Hugh F. Fitzpatrick. *J. Thorac. Surg.*, 1956, 32: 424.

Hypoventilation followed by anoxia and respiratory acidosis may be induced by preoperative sedation, the anesthetic agent, and skeletal muscle relaxants. Anesthetic techniques such as laryngoscopy and endotracheal intubation may also contribute to malventilation and hypoventilation.

Special studies indicated that respiratory acidosis started with the administration of anesthesia and continued to the end of induction after endotracheal intubation. Acidosis could be prevented if the time between breaths was shortened to 30 seconds or less.

Complications due to difficulties in intubation may result in undesirable circulatory changes, an altered electrocardiogram, vagal reflexes, and irregularities of the arterial pulse. Intubation of the trachea in itself may cause both an increase in the blood pressure and in the heart rate. An endotracheal tube inserted deep into the trachea with pressure against its wall may cause circulatory disturbances and arrhythmias. In patients with diminished myocardial reserve intubation should be done under topical surface anesthesia with the patient in the conscious state.

—*B. G. P. Shafiroff, M.D.*

A Comparison of 2 Systems of Anesthesia for Thoracic Surgery: Ether Versus Thiopental-Succinylcholine. Henry K. Beecher. *J. Thorac. Surg.*, 1956, 32: 419.

Ether anesthesia is compared with thiopental succinylcholine anesthesia for use in thoracic surgery. Obstructing secretions in the respiratory airways can be more easily aspirated with patients anesthetized with the muscle relaxant than by ether. To abolish cough, considerable depth of ether anesthesia is required, which necessarily also depresses the patient's blood pressure, but with succinylcholine cough can be controlled easily under light anesthesia.

Anoxia does not appear to be a problem with either system of anesthesia. However, in cases of obstruction of the airway, intubation and aspiration can be more swiftly effected in patients under the muscle relaxant sequence. Elevation of carbon dioxide tension can be controlled best by use of ventilators which are more efficient when used with the muscle relaxants than with ether anesthesia. During open thoracic procedures ether anesthesia is well tolerated by the elderly patient with little circulatory strain. Thiopental succinylcholine anesthesia has been effective in prolonged transthoracic procedures, but may be hazardous in patients in hemorrhagic shock or with crippled cardiovascular systems. The significance of peripheral stagnation with cyanosis of the toes and fingers due to thiopental and relaxants is not fully understood and must await further evaluation

—*B. G. P. Shafiroff, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

A Clinical Study of 51 Cases of Mesenteric Infarction. CONRAD B. JENSON and GRAFTON A. SMITH. *Surgery*, 1956, 40: 930.

ALTHOUGH THE MORTALITY of intestinal obstruction has declined in the past 2 decades, mesenteric vascular occlusion still carries a mortality of 80 per cent. This fact stimulated the authors to review 51 cases of mesenteric infarction seen at the University of Minnesota Hospitals, Minneapolis, Minnesota, between January 1, 1942 and April 1, 1954. Cases in which the vascular occlusion was secondary to mechanical intestinal obstruction were excluded.

Arterial occlusion occurred twice as often as venous occlusion, and was associated with cardiovascular disease in 80 per cent of the cases. Arterial occlusion is usually due to arteriosclerosis or rheumatic cardiovascular disease, but may be secondary to subacute bacterial endocarditis, periarteritis nodosa, or blood dyscrasias.

Recent abdominal surgery was the second most frequent condition associated with mesenteric infarction laparotomy having been performed within 30 days preceding admission in 19.5 per cent of the cases. The most frequently reported operation preceding mesenteric infarction was splenectomy for congenital hemolytic jaundice, although this was true in only one case in the series presented.

In mesenteric venous thrombosis, no etiological factor was noted in 55.5 per cent of the cases. In the remainder, peritonitis, blood dyscrasias, and operative trauma were implicated.

Clinically, there may be sudden complete occlusion of a major mesenteric artery, or gradual occlusion of a vein or artery. Sudden occlusion occurs usually in a patient with a history of cardiac disease. The onset is characterized by sudden, severe, colicky pain, occasionally with back radiation. Nausea, vomiting, and shock soon occur. Melena is uncommon. Abdominal distention is minimal, but hypoperistalsis occurs. Abdominal tenderness may be a late finding. Markedly elevated temperatures are uncommon, although leucocytosis with neutrophilia is the rule.

In contrast with the foregoing, in the authors' series, more than one-half of the patients with mesenteric venous or arterial thrombosis and one-third of those with arterial embolism had symptoms for one week or more before they sought medical care. In such cases of gradual occlusion there is a prodromal period which may last for days; it is characterized by crampy abdominal pain, occasionally precipitated by meals. Abdominal distention is mild. This period is followed by an interval of paralytic ileus with minimal distention and then by full-bloom infarction with all its sequelae.

Leucocytosis and neutrophilia are almost always present. Melena was present in 30 per cent of the cases.

Peritoneal tap yielded bloody fluid in 78 per cent of the cases of mesenteric venous thrombosis, whereas it was less often positive in the presence of mesenteric arterial occlusion.

Roentgenographic findings are not pathognomonic, but are suggestive of paralytic ileus. Moderate distention of small and large bowel which stops at the transverse colon or splenic flexure may be significant as well as the extreme absence of intestinal gas, suggestive of fluid-filled loops.

Mesenteric infarction carried the highest mortality rate (76.5 per cent) in a recent review of cases of bowel obstruction at the University of Minnesota Hospital. The authors stress delay in diagnosis as an important factor in producing the high mortality rate; also, they emphasize the diagnostic value of sanguineous peritoneal aspiration in patients with abdominal tenderness and leucocytosis.

There was a marked difference between the mortality of venous and that of arterial occlusion; in the former cases, only 11.1 per cent of the patients died and there was no operative death, while 88.6 per cent of the patients with superior mesenteric arterial occlusion died. When it was necessary to resect less than 200 cm. of bowel, the mortality was only 11.1 per cent, regardless of etiology. The high mortality of arterial occlusion is probably due to its sudden onset, more massive nature, and frequent occurrence in patients with pre-existing cardiovascular disease.

Aggressive surgery is the only adequate therapy. Twelve of 20 patients subjected to primary resection and anastomosis survived operation. The mortality rate for all of the patients subjected to bowel resection was 30 per cent. The authors believe that postoperative anticoagulant therapy will prevent the development of thrombosis. Supportive antibacterial chemotherapy is also indicated.

In summary, the authors contend that early laparotomy in patients with abdominal pain, tenderness, and leucocytosis with pre-existing cardiovascular disease will reduce the present high mortality rate. Aggressive surgery with resection of the major portion of the small bowel is compatible with life and may save patients otherwise doomed. —*Edward M. Miller, M.D.*

A Modification of the McEvedy Repair of Femoral Hernia. G. L. MOUZAS and P. L. C. DIGGORY. *Lancet*, Lond., 1956, 2: 1073.

A TRANSVERSE incision 2 to 3 inches long is made in the inguinal region following Langer's lines, with its midpoint overlying the lateral edge of the rectus sheath 1 inch above the pubic tubercle. The rectus sheath is freed from fat and incised for 2 to 3 inches vertically, midway between the pubic symphysis and tubercle, and extending down to the bone.

The rectus muscle is retracted medially, the transversalis fascia is incised, and the peritoneum is packed off from the field of operation. This reveals the neck of the femoral hernia in the femoral ring. The surgeon's finger protects the femoral vein while delivering the sac. If the hernia is incarcerated the lacunar ligament medial to the sac is incised.

After ligation and excision of the sac, repair of the gap between the femoral vein and the lacunar ligament is done with a 0.5 inch wide flap made from the pectineal (Cooper's) ligament which is sutured to the transversalis fascia.

Thirty-two patients with femoral hernia were operated upon with this technique with apparently good results. The authors claim that this technique provides better exposure than other techniques, and that an inguinal hernia can be dealt with at the same time.

—*Harold Laufman, M.D.*

GASTROINTESTINAL TRACT

Acute Hemorrhage from Peptic Ulcer; a Follow-Up Study of 310 Patients. AUSTIN B. CHINN, ARTHUR S. LITTELL, GEORGE F. BADGER, and ARGYLE J. BEAMS. *N. England J. M.*, 1956, 255: 973.

THREE HUNDRED and ten patients with proved peptic ulcer, in whom manifest acute hemorrhage occurred immediately before or during hospitalization, have been reviewed from the records of the University Hospitals in Cleveland for the years 1936 to 1948. The diagnosis was established before or after hemorrhage by roentgenologic, surgical, or pathologic examination. The occurrence of acute hemorrhage was established by the presence of at least 2 of the following 3 criteria: (1) a history of sudden hematemesis or melena, or both; (2) the presence of anemia (red cell count below 4 million and hemoglobin less than 10.5 grams) within 3 days of hemorrhage; and (3) the presence of blood in the stools (gross examination), by a strongly positive chemical test, or by both; 89 per cent of the cases met all three criteria.

The authors were particularly interested in the part played by acute hemorrhage in the natural history of the disease. For each patient, the first hemorrhage treated in the University Hospital between January 1, 1936 and September 31, 1948 was called the index hemorrhage, and the date of that hemorrhage was taken as the date of the patient's admission into the study. Of 310 patients 292 (94.2 per cent) had been satisfactorily followed. A total of 243 patients had duodenal ulcer; 15 had gastric ulcers; and in another 15 the ulcer was anastomotic, multiple, or it could not be identified definitely.

Of 173 patients whose index hemorrhages were due to duodenal ulcer and who had had no previous hemorrhage or operation, those patients who survived the index hemorrhage and continued under medical management had a 31 per cent chance of having a second hemorrhage within 5 years of the first. Those who survived the second hemorrhage and continued under medical management had a 64 per cent chance of having a third hemorrhage within 5 years of the second. The age of the patient did not influence the chance of a second hemorrhage from duodenal ulcer, but the rate of mortality from the initial hemorrhage increased with age. The least favorable prognosis was in the patient with duodenal ulcer who had had multiple acute hemorrhages and was over 50 years of age. In patients over 50 years of age the mortality rate from the initial hemorrhage from gastric ulcer was markedly higher than in younger patients.

—*Allan D. Callow, M.D.*

The Surgical Treatment of a High Lying Gastric Ulcer. RICHARD K. GILCHRIST. *J. Am. M. Ass.*, 1956, 162: 1039.

THE AUTHOR discusses the problem of gastric ulcer in relation to bleeding and malignancy. About 5.5 per cent of gastric ulcers are located in the cardia. The preoperative diagnosis of a lesion as benign or malignant is most uncertain, and no combination of symptoms or findings allows for a very high degree of predictability. In a large series of gastric ulcers diagnosed as benign, 12.7 per cent were found to be malignant. In another series of ulcers, thought to be malignant, not a single neoplasm was found. The association of duodenal ulcer with gastric ulcer is not infrequent (12 per cent). The duodenal ulcer may antedate the development of the gastric ulcer, and these patients may have hyperacidity. Free perforation is not common, but penetration into the adjacent viscera is not uncommon. Hemorrhage is not an infrequent complication of gastric ulcer, and it occurs in about half of the cases.

Perforation is of course an indication for operation; persistent bleeding also is an indication. At the time of operation the author advises that the stomach be opened widely in search for the bleeding point. If none is found a resection of three-fourths of the stomach is done. Should bleeding continue after this, reoperation is indicated and a near total gastric resection is done.

When a large adherent gastric ulcer is found, medical treatment is indicated to reduce the inflammatory reaction prior to surgery. These large ulcers are usually benign. Unexpected malignancy in an ulcer is most commonly found in the small lesions. At surgery numerous specimens for biopsy should be taken if there is doubt concerning the nature of the lesion. About 30 per cent of the patients survive 5 years if the preoperative diagnosis is benign ulcer but subsequent examination points to a malignant ulcer.

The two essential operative approaches described are different in that an attempt is made to resect the ulcer in one, and in the second procedure the ulcer is left undisturbed and a subtotal gastric resection is performed. Both types have their adherents, but the author recommends excision and subtotal resection. Occasionally, in poor risk patients a gastroenterostomy, with a feeding gastrostomy may be indicated.

—*Richard L. Lawton, M.D.*

Sarcoma of the Stomach. REIDAR EKER, JON EFSKIND, and JOHANNES ZIMMER. *Acta chir. scand.*, 1956, 111: 386, 390.

EKER AND EFSKIND present a follow-up study of 45 cases of sarcoma of the stomach. The group represented 2.5 per cent of a total of 1,784 partially or totally removed stomachs with malignant tumors examined at the Laboratory for Pathology of the Norwegian Radium Hospital between 1939 and 1954.

Of the 45 sarcomatous tumors of the stomach, 21 were diagnosed as malignant hemangioendotheliomas, 17 as malignant lymphomas, and 7 as leiomyosarcomas. The patients ranged in age from 14 to 74, with an average of 53.7 years.

For the recorded period of observation 27 of the 45 patients are alive and without symptoms. In this

group, 20 of 26 patients are alive and without symptoms after more than 5 years. The prognosis for the patients with sarcomas is thus considerably better than the well known, very poor prognosis for patients with gastric carcinomas.

The most favorable group included the patients with the leiomyosarcomas, in which 6 of 6 patients are alive and without recurrence for more than 5 years. The prognosis for patients with malignant hemangioendotheliomas is also good, as 9 of 11 patients are alive without recurrence after 5 years. The prognosis for the patients with malignant lymphomas is somewhat poorer. Five of 8 patients are free of symptoms after 5 years.

Zimmer presents a clinical and roentgenologic study of sarcoma of the stomach based on the 45 cases analyzed by Eker and Efskind.

Upper abdominal distress and/or dull pains are the most constant early symptoms in sarcomas of all kinds. This statement holds true for only half of the patients with leiomyosarcoma. Only 4 patients had real peptic ulcer symptoms. Only one-fourth of the tumors were palpable before operation. Vomiting which occurred very seldom is explained on the basis that sarcomas are usually soft and pliant, with only slight tendency to obstruct the lumen completely. In this series achlorhydria was more often associated with leiomyosarcomas than with the other 2 types of sarcomas. With one exception the lesions in this series occurred in the lower third of the stomach.

Roentgenologically, sarcoma should be suspected if a sharply defined, rounded or oblong, lobulated tumor is seen. If the lesion spreads diffusely, as lymphomas sometimes do, the gastric rugae become shortened, broadened, and less pliant. Occasionally sarcoma of the stomach gives the picture of polyposis, and a completely negative finding has been reported.

—*Harold Laufman, M.D.*

Surgical Treatment of Gastric Carcinomas and Its Results (Ueber die chirurgische Behandlung des Magencarcinoms und deren Ergebnisse) A. KUMMER. *Chirurg*, 1956, 27: 481.

IN VIEW of the fact that at the time of exploration the surgeon cannot be sure of the extent of gastric carcinoma, the author recommends frozen sections obtained from the proximal and distal lines of resection as well as from the removed lymph glands and the other organs partially removed, such as the pancreas and colon.

Unless the patient's resistance is very low, the author explores the abdomen through a small transverse incision, and then extends the incision, after the rib cartilage is severed, into the eighth intercostal space so as to open the chest. He frequently also employs Donald Ross' curved incision, which is carried over the costal arch and downward in a curve.

The creation of pneumoperitoneum 2 weeks prior to the operation leads to gastroptosis and the descent of the lower segment of the esophagus into the peritoneal cavity, which facilitates the performance of the anastomosis and the resection of the distal end of the esophagus.

The so-called retrograde method of gastric resection, originally devised for the removal of duodenal ulcers, is now also used in patients with cancer of the stomach. The parietal peritoneum is incised above and below the duodenum, close to the wall of the gut to avoid injury of the common duct. The duodenum is carefully separated from the pancreas and severed between two clamps above the papilla of Vater. The distal end of the stomach with the adjoining part of the duodenum is then turned over to the left and the rest of the operation is performed in the customary manner.

If the tumor cannot be removed, a palliative esophagojejunostomy according to Roux's method should be considered.

The author reviews 199 cases of gastric carcinoma in which an operation was performed in four surgical clinics of Amsterdam within the last 2 years. Of the 199 patients, 147 were men and 52 were women.

The antrum was the most frequent site of carcinoma in both sexes. No relation could be established between the duration of symptoms before the operation and the survival period. In cases in which a radical operation was no longer possible, palliative procedures did not increase the operative mortality but they did prolong the survival period. The mortality of 34 per cent after total gastric resection, as compared to a mortality of 8 per cent following partial resection with extensive removal of the lymph glands, demonstrates the superiority of the last-mentioned procedure. Total gastric resection with a wide excision of the lymph glands is indicated only in cancer of the corpus or cardia.

—*Joseph K. Narat, M.D.*

The Billroth I Gastrectomy. PAUL HICKINBOTHAM. *Brit. J. Surg.*, 1956, 44: 206.

THE AUTHOR who is an advocate of the Billroth I subtotal gastrectomy reports his results with 276 patients who underwent the operation prior to 1952. Of main concern is the incidence of recurrent ulcer, stenosis at the suture line, and the "dumping syndrome." Twenty-two of the patients were operated upon for gastric carcinoma with a 13.6 per cent operative death rate. Fourteen of this group died of recurrence following the operation. Three of the original 22 (13.6 per cent) were alive and well between 3 and 4 years following the operation. The operative mortality was considerably less for the other groups of patients considered with the following rates: gastric ulcer 0.8 per cent, duodenal ulcer 5.0 per cent, and gastric and duodenal ulcer 5.3 per cent. The author believes the mortality rate of the Billroth I operation for duodenal ulcer has decreased markedly from the 5 per cent reported, because of the inclusion of their earliest experience in that figure.

The recurrence rate is high (11.5 per cent) when the Billroth I operation is performed for duodenal ulcer. Most of the recurrences have been verified by reoperation. The symptoms of recurrence started between 3 months and 4 years after gastrectomy, the average being approximately 2 years. The follow-up of the majority of the patients reported was less than 4 years, though over 2 years in all cases. Further recurrences can be expected in the future. The author does not believe the high recurrence rate with the Billroth I operation is due to a smaller gastric resection, since he has on many occasions converted a

Polya-type resection to a Billroth I resection without difficulty. The recurrence rate of Billroth I resection done for gastric ulcer is less than 1 per cent. The author believes the Billroth I subtotal gastric resection is unsuited to the treatment of duodenal ulcer and has adopted vagotomy combined with a low Billroth I gastrectomy.

The development of postoperative stenosis, a troublesome complication in the past, has occurred infrequently in the present series. Two vital factors in technique are stressed; the anastomosis must be performed without tension and the blood supply to the stomach and duodenum must be adequate. Less trouble is encountered if the duodenum is not mobilized from the pancreas. Very often if a comfortable length for suturing is obtained, avascular necrosis will follow. It is better to do a difficult and less neat anastomosis to a duodenum of unquestionable vascularity.

The patients have been classified according to the incidence of digestive complaints. Those considered satisfactory have no digestive symptoms; those improved, have definitely derived benefit from the operation, are doing full time jobs, but have some symptoms referable to digestion; and those considered as failures have known or suspected recurrences, or present stenosis. On this basis the Billroth I resection is 87 per cent successful for gastric ulcer, and 74 per cent successful for duodenal ulcer.

—Lloyd D. MacLean, M.D.

Anemia Following Partial Gastrectomy; a Review of 100 Cases. HUGH W. MACINTYRE and LOIS STENT. *Brit. J. Surg.*, 1956, 44: 150.

ANEMIA is a common occurrence following partial gastrectomy and is discovered only with specific examination. In the reported series of 100 patients, 70 were men and 30 were women, and the average time of examination following partial gastrectomy was 4 years and 3 months. The operation was performed for gastric ulcer in 52 instances, combined gastric and duodenal ulcer in 26, and duodenal ulcer in 21 patients. One patient underwent partial gastrectomy for hematemesis without the demonstration of an ulcer. Forty-four of 100 patients were anemic at the time of examination. The anemia level for both males and females was arbitrarily placed at a hemoglobin of below 12.6 grams per 100 milliliters. In this series an equal number of males and females had anemia. The commonest type of anemia was the hypochromic, normocytic variety. Normochromic, normocytic and hypochromic, microcytic anemias were somewhat less common. A macrocytic anemia with megaloblastic bone marrow was found to exist in 2 of the 100 patients.

The authors believe the etiology of iron deficiency anemia after partial gastrectomy to be the result of the removal of hydrochloric acid-producing tissue with poor iron absorption. Malabsorption of iron also may be due to the rapid passage through the intestine or to the alteration of bacterial flora. No mention is made by the authors of the microscopic appearance of the resected stomach in the patients who later were found to have developed megaloblastic anemia.

—Lloyd D. MacLean, M.D.

Duodenal Ulcer and the Hypophysis-Adrenal Stress Mechanism. HERZL RAGINS, LESTER R. DRAGSTEDT, II., JOHN H. LANDOR, EDWIN S. LYON, and LESTER R. DRAGSTEDT. *Surgery*, 1956, 40: 886.

THE AUTHORS have found in a series of 1,100 patients with duodenal ulcer that the fasting nocturnal secretion of gastric juice was three to twenty times greater than that found in normal people. Experimentally produced hypersecretion of gastric juice regularly produces duodenal ulcer in animals. Vagotomy has been found effective in abolishing hypersecretion and, when combined with gastroenterostomy, has resulted in the healing of duodenal ulcers. These observations have led to the conclusion that duodenal ulcers are caused and maintained by neurogenically stimulated hypersecretion of the gastric juice mediated through the vagus nerves.

Recent reports, while accepting the anterior hypothalamus-vagus mechanism as the mediator of the ordinary cephalic phase of secretion, have focused attention on the hypothalamus-adrenocortical axis as a cause of gastric hypersecretion in stressing situations. The posterior hypothalamus is visualized as receptor of physical stress stimuli from epinephrine released from the adrenal medulla and of mental stress stimuli directly from the cerebral cortex. These stimuli are transmitted to the anterior pituitary lobe, which in turn releases ACTH and causes an excessive secretion of cortisone by the adrenal cortex. Cortisone then acts directly on the gastric glands to produce a hypersecretion of acid. Thus, two cephalic mechanisms are described, one "vagal" and the other "extravagal."

In the authors' experiments, Heidenhain (isolated denervated) pouch dogs were given large doses of insulin, epinephrine, ACTH, cortisone, and hydrocortisone to evaluate the extravagal pathway of secretion. Massive intravenous doses of insulin failed to produce a delayed or extravagal response 3 to 5 hours after the injection. Massive doses of epinephrine did not cause acid secretion. There was no acid reaction after the injection of ACTH. Finally, cortisone and hydrocortisone caused no secretion of acid. The authors' conclusion is that the exacerbation of peptic ulcer produced by ACTH and cortisone is probably not a result of increased gastric acid secretion.

—Edward M. Miller, M.D.

Late Results of Vagotomy Combined with Gastrojejunostomy or Pyloroplasty in the Treatment of Duodenal Ulceration. J. A. LLOYD DAVIES. *Brit. M. J.*, 1956, 2: 1086.

THE AUTHOR presents an analysis of 366 cases of chronic peptic duodenal ulceration treated by vagotomy combined with either gastrojejunostomy or pyloroplasty for the most part 5 years or more after surgery. In all the cases taken from several surgical centers throughout the country, section of the vagi was performed transabdominally. Pyloroplasty was usually performed by the method of Heineke-Mikulicz. In other patients pyloroplasty and pylorectomy by the method of Beattie was employed.

In the series 50.6 per cent of the patients were found to be completely free of symptoms; 34.2 per cent were found to have mild symptoms which caused no disability; 5.8 per cent suffered moderate symptoms that

were not relieved by care, but considered themselves improved symptomatically; 3.3 per cent had moderate symptoms not relieved by care and clinical results that were judged unsatisfactory; and 6.1 per cent were not improved whatsoever.

The 65 per cent who maintained a steady normal weight postoperatively and the 21.8 per cent who had gained weight well comprised a group of 86.8 per cent with a satisfactory postoperative nutritional result. Minor weight loss occurred in 8.2 per cent and considerable loss in 1.5 per cent. It would appear that there is significant evidence that weight maintenance after vagotomy and gastric drainage is more generally satisfactory than after partial gastrectomy.

Proved and presumed recurrent ulcerations (on the basis of symptoms) gave a total of 5.1 per cent in the whole series, and a total of 5.6 per cent following vagotomy and gastrojejunostomy. Five deaths occurred in this series, giving a mortality rate of 1.5 per cent. Recurrent ulceration has not been found when vagotomy has been complete. The recurrence rate of 5.6 per cent after vagotomy and gastrojejunostomy is not regarded as being prohibitive, although it is accepted as higher than that generally achieved by the Polya-type subtotal partial gastrectomy.

There was a 6 per cent incidence of gastric retention after vagotomy and pyloroplasty. This complication did not occur in those patients who underwent vagotomy and gastrojejunostomy. The operation of vagotomy and gastrojejunostomy is recommended for those patients who are considered poor risks for more extensive surgical procedures and in whom postoperative weight gain or maintenance of good nutritional status is important. Moreover, the satisfactory results obtained in women in this series would favor the adoption of this method of treatment in preference to subtotal gastric resection in view of the occasionally disappointing clinical results from the latter operation in women.

In a gratifyingly large percentage of cases complete vagotomy, combined with an adequate gastric drainage operation, is followed by a lasting cure of duodenal ulceration. The final decision as to whether the better clinical results of vagotomy and gastrojejunostomy justifies its general use in the surgical management of duodenal ulceration must, however, await determination of the true recurrence rate with the use of this procedure. —*Allan D. Callow, M.D.*

The Preoperative Reduction of Intestinal Flora with Achromycin, Neomycin, and Intestin-Euvernil; (Die praeoperative Verminderung der Darmflora unter Verwendung von Achromycin, Neomycin, und Intestin-Euvernil). FRITZ. HOLLE, THEODOR DIMMLING, and WERNER DEININGER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 283: 171.

THREE GROUPS of patients were treated as follows: (1) 26 patients were given 1 gram of achromycin in combination with 15 grams of intestin-euvernil daily over a period of 4 days; (2) 5 patients received 12 grams of intestin-euvernil daily for 3 days; (3) 5 patients received a total amount of 9 to 18 milligrams of intestin-euvernil over a period of 3 to 4 days. Quantitative bacterial analysis of the feces was done before the treatment, daily during the treatment, and at least once after the end of the treatment. The administration of intestin-euvernil alone or in combination with achromycin gave similar results. The results were better with higher dosage of intestin-euvernil (gr. 2).

A considerable reduction of the bacterial flora in the stool was obtained in almost all cases. However, the time of the lowest count differed from patient to patient and was always of a short duration. Since the growth inhibition of different species of bacteria occurred at different times during the treatment, a total sterility of the feces was never obtained. Considering all cases, the third day of the treatment was found to be most favorable for surgery.

Good regeneration of the intestinal flora after termination of the treatment was observed. Blood coagulation was unaffected. —*Victor R. Jablokow, M.D.*

Ulcerative Colitis (Colitis ulcerosa). F. DEUCHER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 284: 328.

SINCE 1935, when the mortality from ulcerative colitis was estimated at 50 per cent, the increase of surgery has brought it down to 10 per cent. However, more co-operation between internists and surgeons is still to be desired.

Many cases of ulcerative colitis can be traced back to acute dysentery. Other possible causes are thrombosis of the small end arteries, stress ulcer, and food allergy. Various forms of colitis may be found in combination with regional ileitis in the same patient. The age curve of the disease culminates between 20 and 30 years. The disease takes a chronic course in most cases. The clinical picture is far from uniform and the diagnosis is difficult.

The author mentions one case of chronic polyarthritis with erythema nodosum in a patient with colitis; cure was obtained by a subtotal colectomy and ileosigmoidostomy. In 3 cases chronic hypochromic anemia was traced back to regional or total colitis. Intestinal phlegmons with painful meteorism were encountered in cases of acute colitis; later edematous epithelial islands were observed in the area of ulceration. These remnants of mucosa then develop into single pseudopolyps or into a diffuse pseudopolyposis. Granulomatous changes occur frequently. Such structural changes of the mucosa may often lead to postcolitic carcinomas after the disease has been pres-

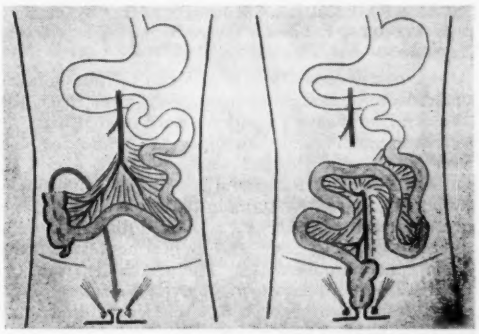


FIG. 1. (Deucher). Replacement of the colon by the rotation of the cecum.

ent for many years. Even a functionless colon (after enterostomy) may become cancerous. The smooth atrophic mucosa of the cured colitis is also known to be predisposed toward carcinoma.

The external inspection of the colon at laparotomy is nonconclusive in cases when the lesions are still limited to the mucosa and submucosa. The extent of the lesion cannot be appreciated by x-ray examination and palpation only. With the help of rectoscopy a correct diagnosis is assured in almost all of the cases. The rectum is involved in 85 per cent of all cases of colitis.

In view of all the complications of colitis, the prognosis is poor. Conservative therapy may be successful in acute colitis. The more prolonged the illness, the more resistant it becomes to medication. There is no question concerning the justification of colectomy as man can do very well without the colon. Resistance to therapy, frequent recurrences, and indefinitely prolonged treatment, also local and general complications, hemorrhages, and perforations are indications for surgery. The author refutes sigmoidostomy and cecostomy in favor of terminal ileostomy. He believes that the prognosis is better when all of the colon is removed regardless of the extent of the colitis. Rectocolectomy with ileostomy gives the best assurance of complete recovery. A table shows that 31 of 39 patients recovered completely after colectomy and ileostomy, and 25 of 32 recovered after colectomy and anastomosis.

Anastomosis can be considered in cases of regional colitis when the rectum is not affected. End-to-end anastomosis between the ileum and the descending colon, sigmoid, or rectum can be executed in one to three stages. In case of proctocolitis on the left side the cecum or the ascending colon may be rotated on its mesentery and anastomosed end-to-end with the lower end of the rectum. In case of total colitis ileoanostomy is also possible, but the author thinks that ileostomy is more advantageous for the patient.

Colectomy is by no means the final solution to the problem of colitis, but it is indispensable as long as the etiology of colitis remains obscure and other forms of treatment are of little avail.

—*Victor R. Jablokow, M.D.*

The Healing of Anorectal Wounds with Reference to "Rectal Medication." Robert Turell, Marcelino J. Avecilla, Eldridge Gates Morgan, and David W. Moss. *Arch. Surg.*, 1956, 73: 870.

After the performance of an open technique hemorrhoidectomy or sphincterotomy for anal ulcer, the anorectal wounds of 25 patients were treated with the following medications: an ointment containing cod liver oil, an ointment containing vitamins A and D, lanolin, a hydrophilic cream containing chlorophyll, hydrophilic cream containing hydroxyquinoline, hydrophilic ointment U.S.P., a bland lubricating mixture of tragacanth paste, and an ointment containing 2 per cent aminobenzoate. The ointments were applied every 2 or 3 days with a gloved finger beginning on the fifth postoperative day and continuing until complete healing took place.

None of the ointments caused healing to progress any faster than in the control cases. Cutaneous sensitivity reactions occurred in 3 of 10 patients in whom anesthetic ointments were used. The author concludes that dependence on ointments is no substitute for good surgery.

—*Harold Laufman, M.D.*

Deep Proctogenic Abscesses and the Importance of Trigonum Fibrosum Diaphragmatis Pelvis for the Genesis of Secondary Supralevator Fistulous Abscesses (Zur Kenntnis der tiefen proktogenen Abscesse und der Bedeutung eines Trigonum fibrosum diaphragmatis pelvis fuer die Entstehung des sekundaeren supralevatorischen Fistelabscesses). H. J. Betzler, Ch. Jerusalem, and H. Holzhausen. *Chirurg*, 1956, 27: 487.

The pelvic floor of 40 cadavers was searched by the authors for preformed sites of penetration of periproctitic abscesses with secondary formation of pelvirectal suppurative foci, which may also be called supralevator abscesses.

Ninety per cent of the anal fistulas resulting from diverticular abscesses of Morgagni's sinuses are located below the levator muscle. Eighty per cent of all periproctitic abscesses are marginal, i.e., they spread in subcutaneous direction in the immediate vicinity of the anus, without invasion of the ischiorectal space. The paramarginal abscesses spread along the intermuscular septum because the superficial perineal fascia forms an obstacle to their extension toward the skin. Such infralevator phlegmons may reach the scrotum or the inguinal region, or they may penetrate the supralevator subperitoneal space, forming so-called pelvic, pelvirectal, or subperitoneal abscesses.

Primary subperitoneal perirectal abscesses originate in the prostatic gland, inflammatory processes of the pelvic bones, sacrum, female adnexa, or appendix. Secondary supralevator abscesses develop from ascending perianal or periproctitic suppurative processes which in turn originate mostly in anal fistulas.

The authors are of the opinion that a secondary pelvic abscess derives from a fistulous tract which communicates with the gut distal to the anorectal ring. A branch of such a fistula penetrates the levator muscle and forms a supralevator abscess. Stereoscopic roentgen pictures and operative observations show that the abscess cavity lies caudal to the piriform muscle and anterior to the sacrospinal ligament or the coccygeus muscle.

In 27 of the 40 dissected cadavers the pelvic diaphragm was found completely closed, with the exception of the slit between the levator muscles. In 13 cadavers a space not covered by muscles was found between the ileococcygeus and coccygeus muscles. This triangular space which was unilateral in 8 instances and bilateral in 5, was bridged by the internal and external fascia of the pelvic diaphragm. The authors suggest the term "trigonum fibrosum diaphragmatis pelvis" for this structure and consider it as a site of lesser resistance which facilitates the spread of a periproctitic abscess from the ischiorectal fossa to the supralevator space.

—*Joseph K. Narat, M.D.*

Vascular Invasion in Carcinoma of the Colon and Rectum. Francis J. Burns and John Pfaff, Jr. *Am. J. Surg.*, 1956, 92: 704.

The authors report their studies of 571 cases of clinically diagnosed colonic and rectal carcinoma at Firmin

Desloge and St. Mary's Hospitals in St. Louis, Missouri, during a 10 year period from 1940 through 1949. Of these, only 338 were suitable for this study. It was necessary to include surgically resected or autopsied malignant epithelial tumors on which there was adequate tissue for evaluation of vascular invasion.

Of these 338 cases, all were adenocarcinomas with the exception of one rectal squamous cell tumor. This careful examination of even the smallest vascular channels about the tumor disclosed an incidence of 49.7 per cent of malignant invasion, a figure significantly higher than that previously reported by other investigators. The authors believe that the true incidence of neoplastic vascular invasion may be even higher than this study revealed.

The results indicate a prognostic significance of tumor invasion of the small venous channels. In 74 per cent of the cases in which this had occurred, subsequent vascular dissemination took place. In 26 per cent of the cases with no evidence of metastasis, one or more of several factors may have been implicated. It is possible that all tumor tissue was removed at operation prior to tumor embolization, or that the patient died before metastases were recognizable. One may speculate that in other cases tumor thrombi would never become emboli, or that, if disseminated, the emboli would remain dormant or die.

Of the 119 cases evaluated terminally with regard to the cause of death, 57.2 per cent revealed visceral metastasis as the most significant lethal factor. Only 9.3 per cent represented regional tumor extension. The invasion was local, causing death by interference with adjacent vital structures, such as ureteral obstruction with pyelonephritis and terminal uremia. This small proportion indicates that the growth pattern of colonic and rectal carcinomas is not one primarily of local extension. —*Matthew H. Evoy, M.D.*

Recent Trends in the Treatment of Cancer of the Colon and Rectum. NEIL W. SWINTON. *Am. J. Surg.*, 1956, 92: 727.

THE AUTHOR reports the results of a careful study of treatment of cancer of the colon and rectum during the years 1945 to 1949, inclusive, and reviews the recent literature on this subject. All of the patients were treated at the Lahey Clinic in Boston, Massachusetts. Nine hundred and one cases of cancer of the colon and rectum are reported. The operability rate was 100 per cent whereas the resectability rate was 93 per cent. One hundred and sixty-eight patients, or 20 per cent, were considered to have palliative operative procedures. The mortality rate for the entire series was 56 per cent. Follow-up studies were made in 99 per cent of the cases and an absolute survival rate of 43 per cent was obtained. In the palliative group it was found that 36 per cent of the patients survived more than 2 years.

At the Lahey Clinic it is believed that the preliminary ligation of the blood supply to any area of the colon which is being removed is advantageous and should be done. The workers are not as yet convinced that the routine dissection of the preaortic nodes will materially improve their survival rates. In addition to the ligation of the inferior mesenteric artery, both hypogastric arteries may be ligated with impunity as a further measure to minimize the blood loss during a combined abdominoperineal resection. A discussion of the latter procedure involving the hypogastric vessels is presented in this article, and although the author has performed it only on 3 occasions without untoward effects, he reports that Bacon has done it without trouble for 3 years.

The necessity for preliminary ligation of the vessels and the lumen of the bowel proximal and distal to the tumor before any manipulation of the growth is carried out is stressed in this article.

—*Matthew H. Evoy, M.D.*

Twenty-Five Year Experience in Surgery of Rectal Cancer (Vingt-cinq années d'expérience de la chirurgie du cancer du rectum). F. D'ALLAINES. *Bruxelles-méd.*, 1956, 36: 2187.

THE AUTHOR compares the results of 239 abdominosacral operations for cancer of the rectum, performed before 1946, with the results of 158 abdominoretroanal operations used since 1946, In the first group 80 per cent of all the patients were operable while in the second group the operability had risen to 87 per cent. Sphincter-preserving operations were performed in 74 per cent of the first series and in 70 per cent of the second series.

As a rule, a sphincter-preserving operation is contraindicated in young individuals because lymphatic, venous, or tissue invasion by cancer cells takes place in such patients not only in the cranial but also in the downward direction. Caution is advisable also in obese individuals because the cicatrization is frequently impaired and the suture line may not hold.

The author removes the primary tumor in the presence of metastases in the liver because the clinical symptoms are eliminated by the operation and the development of metastases may occasionally be retarded. A solitary nodule in the liver is excised or partial hepatectomy is performed.

The modern methods of preoperative preparation and of anesthesia have rendered the sphincter-preserving operation less dangerous. This procedure can be employed for tumors located higher than 10 cm. above the sphincter.

The principles governing the extent of resection remain unchanged.

Anterior resection is now more frequently used than the abdominosacral approach. If the last-mentioned method is employed, resection of the sacrum is never necessary. Furthermore, the term "abdominosacral" should be replaced by "abdominoretroanal."

The author continues performing the Babcock pull-through operation in cases in which the tumor is located from 8 to 10 cm. above the anus, if the patient firmly refuses colostomy. In a series of 37 operations the operative mortality was 8.3 per cent, continence of the sphincter 30 per cent, and the 5 year survival rate 31.2 per cent.

In approximately one-third of the entire material, abdominoperineal amputation with iliac colostomy was performed. The operative mortality was 4.3 per cent and the 5 year survival rate 45.8 per cent.

The author compares the results obtained before and after 1946 and comes to the conclusion that there are only insignificant differences as far as the late re-

sults are concerned. The operative mortality did not change, but a larger percentage of cases are now considered operable. —*Joseph K. Narat, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Some Physiologic Effects of Short-Term and Long-Term Hypothermia upon the Liver. BERNARD FISHER, E. J. FEDOR, SIL H. LEE, WILLIAM K. WEITZEL, and Others. *Surgery*, 1956, 40: 862.

SINCE HYPOTHERMIA has become widely used, a study of its effects on liver function and the metabolism was undertaken.

The effects of hypothermia upon the liver were observed from four aspects—biliary secretion, in vitro oxygen consumption of the liver slice, composition of the liver, and hepatic blood flow estimation. Quantitative information concerning these four factors during short and prolonged cooling and following rewarming formed the basis of this report.

All animals during the 6 or 12 hours of hypothermia continued to secrete bile, but the volume was markedly decreased (over and above the decrease from ether anesthesia used during induction of the hypothermia). This decrease was progressive with the duration of the hypothermia. In spite of the marked reduction in biliary secretion, cholic acid concentration was not significantly depressed during the cooling period. Following rewarming in all of the animals, the bile volumes were again normal in 24 hours after the shorter period of cooling (6 hours), and in 48 hours following the longer one (12 hours).

The oxygen consumption of liver slices was approximately 50 per cent of the control levels in animals cooled for 6 to 10 hours, but there was no further decrease in spite of a longer cooling time (up to 28 hours). On the other hand the glycogen content was 40 per cent of the control levels after only 1 to 5 hours and was further depressed to approximately 10 per cent of the control levels after 28 hours. These data seem to indicate that after the sixth hour of hypothermia some oxidative mechanism is interfered with, and that there is no direct relationship between liver oxygen uptake and the glycogen level.

The liver of normal and cooled animals showed no statistical difference in water content and total nitrogen. There was, however, a significant decrease in glycogen, protein nitrogen, protein, and fatty-acid levels in animals cooled 1 to 5 hours. The animals showed a significant increase in the nonprotein nitrogen over the normal during all hypothermic periods. Upon rewarming it was found that these changes in liver composition and oxygen consumption are reversible even after 12 hours of hypothermia.

As the hours of hypothermia progressed it was found that the values for the estimated hepatic blood flow (EHBF, Bradley method) declined so that by 24 hours the values were 18 per cent of the animals not cooled. After rewarming there was a prompt return to the control level and occasionally a significant increase above this value.

Splanchnic oxygen consumption varied little regardless of the duration of the hypothermia and in spite of the decreasing EHBF.

The validity of the Bradley method for EHBF is questioned because of the frequent finding of extrahepatic removal of bromosulphalein as the hours of hypothermia progress. This error would mask an actually lower hepatic flow level and would also tend to invalidate the measurement of splanchnic oxygen consumption. This does not, however, alter the significance of the prompt return of normal hepatic blood flow in all of the animals studied.

—*Arthur M. Simpson, M.D.*

Resection of the Liver (Leberresektionen). K. STUCKE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 284: 629.

LANGENBUCH, in 1887, carried out the first resection of the liver as well as the first cholecystectomy. Burckhardt, at about the same time, carried out exact hemostasis with suture and tamponade of the liver. The animal experiments of Meister, Ponfick, and Gluck demonstrated marked ability of the liver to regenerate. Pathologically speaking, this was more a compensatory hypertrophy than a true regeneration. Work in the past decade by Elias, Bollman, Mann, and Mallet-Guy has shown that the reserve of the liver is such that it can function after the removal of 70 to 80 per cent of its tissue. There was a long lag before planned resection of a portion of the liver was carried out with division of the blood vessels at the site of election. Early work was done by Palacio Ranam in Italy and by Haberer, Wendel, and Rehn in Germany. However, it was not until 1940 that Pettinari carried out the first modern type left hepatectomy and in 1952 that Lortat-Jacob carried out the first hepatectomy on the right side. In recent years much has been learned through the anatomical work of Hjorstjo, Norman, Schmidt, Guttmann, Coinaud, Gans, and Healey. The article includes illustrations taken from Healey (1954), Hjorstjo (1948), and Coinaud (1954). There is at present no universally accepted subdivision of the hepatic anatomy. It is clear that the liver is divided into two completely independent portions, one on the right which consists of the right lobe exclusively, and one on the left which consists of the left lobe plus the quadrate and candate lobes. Coinaud's classification divides the left lobe into four segments: the candate, posterior, anterior, and quadrate, numbered 1, 2, 3, 4, respectively; and the right lobe into the central superior anterior, lateral inferior anterior, lateral inferior posterior, and central superior posterior, numbered 5, 6, 7, 8 respectively.

The two major divisions of the liver allow us to think of it as a paired organ comparable to the lungs and kidneys. Some authors would refer to a removal of the right or left portions as a right or left hepatectomy, and the removal of any subdivision as a lobectomy. From the point of view of operative technique it must be remembered that the liver is more a thoracic than an abdominal organ.

It is most conveniently exposed through a thoracoabdominal incision, with division of the diaphragm. The coronary or triangular ligaments are divided, the liver is freed, and then the porta hepatis is explored with identification of the artery, portal vein, and bile ducts, which are doubly ligated and divided. The lobe or segment of the liver is divided from the remainder with the electric knife, free bleeders being controlled

by digital compression until they can be clamped and tied. Great care must be taken with the small hepatic veins at their point of entry into the vena cava. The transected edge of the liver often requires mattress sutures, and it is best to also cover it with omentum, a slip of diaphragm, or a patch of ligamentous tissue. It is best to drain the common duct by means of a T-tube so as to prevent back pressure in the bile ducts.

Postoperative care involves an understanding of hepatic function, of course, but antibiotics are particularly important for their protective effect against liver necrosis. This may be due to their antibacterial effect or, as Egers has suggested, to some action against necrotizing enzymes.

The indications for resection of the liver are: (1) congenital anomalies, such as accessory lobes; (2) circumscribed chronic inflammatory processes, such as isolated liver abscesses, tuberculomas, and gummas; (3) cysts; (4) tumors (benign or malignant); (5) hepatic injuries; and (6) the destruction of the biliary passages as occurs in the Longmire operation.

The operative mortality in the world literature lies between 10 and 20 per cent. Of 94 patients with primary carcinoma of the liver treated by hepatic resection 13 survived for 3 years, and 3 for 5 years. Theories on the division of the blood stream going to the right and left lobes of the liver have been of limited value with respect to the distribution of hepatic metastasis. Indications for the removal of metastases are not clear. There have been 136 cases of hepatic resection for metastases reported in the world literature of which 8 were successful in that the patients were well at 5 years (5.9 per cent). Wangensteen and Raven, and Burchers and Brunschwig have reported 9, 15, and 17 year survivals after such resections. The world literature reports 1,270 hepatic resections in all, of which 1,000 were not anatomical resections. A true anatomical resection was reported in 198 cases, 45 of the right lobe, and 153 of the left. —*George S. Richardson, M.D.*

Transparietal Splenoportography; Report of Studies on the Hepatogram (Contribution à la splénoportographie transpariétale; étude de l'hépatogramme). G. F. Leroux and A. de Scoville. *Acta gastroenter. belg.*, 1956, 16: 697.

The authors, who are on the faculty of the University of Liége, are pioneers in the field of transparietal splenoportography. They report on preliminary trials of extension of the technique of splenoportography via the percutaneous splenic route to portal infrahepatic visualization of the liver; in 63 splenoportographies, hepatography was successful 50 times. They determined that two principal factors were basic to the success of the method, the injection of an average of 40 c.c. of contrast medium in contrast to the 10 to 20 c.c. which is adequate for splenograms, and the necessity of taking a series of films after the beginning of the injection, at least 15 seconds apart, and preferably in more than one view. Their case material is categorized by clinical diagnosis and results of the roentgenologic examination.

The causes of unsatisfactory hepatograms included: (a) technical difficulties—failure to inject into the substance of the spleen, catheterization of other than the splenic vein, and faulty x-ray equipment; and (b) anatomic causes—thrombosis of the extrahepatic veins or their obliteration by an extrinsic tumor, and splenic infarction. (The left lobe of the liver is always more difficult to visualize than the right.) The normal and pathologic anatomy of the infrahepatic portion of the portal vein is presented roentgenographically at length.

Among the 50 successful examinations it was possible to define abnormal infrahepatic arborization of the portal vein due to compression by tumor or hydatid cyst. Infiltrating tumors of the liver parenchyma cause lacunar zones with break in continuity of the bordering canalicular opacifications.

Leroux and Scoville emphasize that in the diagnosis of metastatic carcinomas, segmental or nodular, one must compare two phases of the venography: first, the venous opacification and, second, the canalicular. Peripheral nodular metastases are especially difficult to diagnose with certainty; it is important to rule out some of the phenomena of biliary tract obstruction, which interferes with obtaining adequate contrasts. In biliary stasis the defects have more blurred outlines, and when they are multiple they tend to confluence. Roentgenograms of atrophic hepatic cirrhosis have a characteristic appearance, whereas those of hypertrophic cirrhosis do not.

The authors believe that the value of hepatograms will increase as knowledge of the roentgenographic anatomy of the liver expands, and the potentialities of stereoscopic and different positional views are more fully exploited. There is appended a bibliography of 113 references to the pertinent literature.

—*Edwin J. Pulaski, M.D.*

Splenomegaly of Unknown Origin. J. H. Evans. *Guy's Hosp. Rep.*, Lond., 1956, 105: 409.

The author presents a study of those cases which, over a period of 20 years, were diagnosed as splenomegaly with unknown cause. During this time span many of the splenic enlargements were associated with disease processes. Several of the case histories are presented. All of the cases are represented in table form in 3 distinct categories.

Enlargement of the spleen has frequently been associated with anemias. There is much confusion in the older literature because of this association. The concept of portal hypertension as part of the pathophysiology of hepatic cirrhosis has cleared some of the misconceptions.

The spleen varies in weight from 50 to 400 grams, and the minimal palpable weight is thought to be 300 grams. Ability to palpate the organ varies with the type of body build. Several methods of palpation were used. In one the patient was approached from his right and the tips of the right hand sought the organ just below the costal margin. In a second method the patient was placed in a semirecumbent position and an approach was made from behind with the left hand. Deep breathing was encouraged during both palpatory maneuvers.

Thirty-five cases were thought complete enough for evaluation. These were ultimately classified into 4 groups. The first group (17) consisted of those patients with persistent splenomegaly in whom the diagnosis was subsequently established. The majority of these had associated gastrointestinal bleeding and

cirrhosis of the liver. The second group consisted of 3 patients whose diagnosis was uncertain. In the third group were those patients who had persistent splenomegaly with normal health. Seven patients comprised this segment and they had been followed from 1 to 8 years. None in this group was obese. The admission diagnosis in this group covered a wide range. The final group of 8 patients had transient splenomegaly and in the majority of these there was an associated febrile episode.

The splenic size would seem to indicate whether future problems could be anticipated. Those whose spleens could be measured at 3 inches or more from the costal margin invariably developed serious symptoms. —*Richard L. Lawton, M.D.*

MISCELLANEOUS

The Surgical Management of Presacral Tumors. Robert J. Rowe and Dewitt T. Brock. *Am. J. Surg.*, 1956, 92: 710.

The challenging problems which were encountered in the management of 3 unusual presacral neoplasms are presented by these authors, and a very extensive review of the literature regarding the history and treatment of such tumors is presented.

The first case reported was that of a 3.5 year old girl with a ganglioneuroma behind and to the right side of the rectum which was firmly attached to the fascia over the sacrum and coccyx. Part of it had to be removed from the abdominal side and the remaining portion, a week later, through a posterior approach, and even with this exposure the tumor was not accessible and had to be removed piecemeal with the electrocautery.

The second case was that of 69 year old woman who was found to have a very tender mass, approximately 6 by 4 cm., fixed to the sacrum behind and free of the rectum. The tumor was approached by removing the coccyx and the lower end of the sacrum; a biopsy specimen showed fibrosarcoma. The tumor could not be separated from the rectum and it was necessary to transect the rectum above the tumor before complete eradication of the growth could be brought about. The rectum was closed over from the perineal side and then at the completion of the operation a colostomy was fashioned in the left lower quadrant of the abdomen. The patient died 10 months after resection with evidence of severe localized recurrent or residual tumor and distant spread throughout the body.

The third case was that of a 32 year old man with evidence of a smooth, firm protruberance of the upper sacrum approximately 10 cm. from the anus. The tumor was approached from the posterior side, and the presence of the mass was confirmed by digital examination through the loose retrorectal space. Biopsy specimens disclosed Hodgkin's disease, and it was thought advisable to give the patient radiation treatment only. The tumor disappeared promptly after x-ray therapy, and the patient was asymptomatic on last examination.

A very extensive discussion of the surgical management of presacral tumors and recommendations pertaining to the necessary preoperative investigation are given. —*Matthew H. Evoy, M.D.*

CORRECTION

Perforated Acute and Chronic Peptic Ulcer; Conservative Treatment. Hermon Taylor and R. P. Warren. *Lancet*, Lond., 1956, 1: 397.

The words "simple suture" in the fourth line of paragraph 2 of this abstract appearing on page 35 of the January, 1957 issue of the International Abstracts of Surgery should be changed to the word "aspiration."

GYNECOLOGY

UTERUS

The Question of Biologic Evaluation and Therapy of So-Called Preinvasive Portiocarcinoma (Zur Frage der biologischen Wertigkeit und Therapie des sogenannten praeinvasiven Portiokarzinoms). A. PIRINGER-KUCHINKA, I. MARTIN, und E. KOFLER. *Geburtsh. & Frauenh.*, 1956, 16: 971.

DURING THE COURSE of 10 years, 44 cases of preinvasive carcinoma of the uterine cervix were followed up. They were drawn from the following material:

1.	Biopsy with	
	a. Immediate hysterectomy	12
	b. Hysterectomy after 6 months	1
2.	Biopsy with	
	a. Immediate trachelectomy	1
3.	Primary trachelectomy with conization	
	a. Without further therapy	11
	b. With immediate hysterectomy	3
	c. With hysterectomy after 6 months	1
4.	Biopsy followed by irradiation	1
5.	Biopsy followed by observation	9
6.	Accidental discovery in uteri removed for other reasons	6
7.	Misdiagnosis (further biopsies showing invasion)	5

Among the cases in which no radical surgery had been performed, 4 progressed to invasive carcinoma. In 3 of these 4 cases, biopsy only had been performed; they developed cancer within 6 months, 18 months, and 4 years, respectively. In the fourth patient, in whom an extensive cone biopsy had been performed, infiltrating carcinoma developed after 7 years. Multiple serial sections showed that the operation had failed to remove the entire growth.

The authors believe that expectant treatment is insufficient in cases of preinvasive cervical carcinoma. Portio amputation combined with endocervical curettage is recommended as it does not pose a hazard to future pregnancy or prevent further surgery should it become necessary. Sufficient material is also available for complete study. —*Warren R. Lang, M.D.*

Stromal Endometriosis or Endometrial Sarcoma; Re-Evaluation of Old and New Cases, with Especial Reference to Duration, Recurrences, and Metastases. WARREN C. HUNTER, JOSEPH E. NOHLGREN, and STUART M. LANCEFIELD. *Am. J. Obst.*, 1956, 72: 1072.

THE AUTHORS present 7 cases of so-called stromal endometriosis with a review of the 94 cases presented in the literature and discuss some of the pathological and clinical findings in this condition.

This tumor has been reported with sufficient frequency to classify it as a separate disorder having both specific clinical and pathological features. It appears to be derived from endometrial stroma and histologically appears to be benign. The histologic appearance is strikingly similar in the original lesion to that in recurrences and metastatic lesions. Clinically, the tumor behaves as a metastasis derived from a malignant condition either through the lymphatics and blood vessels or by direct extension. The question of whether it is a malignant lesion, and, if so, what histologic features mark it as malignant, is not settled. A number of different names have been applied to it, none of which has proved wholly satisfactory. The authors think that the tumor is malignant because of its diffuse distribution, its projection into the uterine cavity, its poor demarcation, its increased cellularity and mitotic activity, its invasion by the blood and lymph vessels, its continued growth on the peritoneal surface, its recurrence after apparent removal, its ability to kill the host, and its metastasis to distant sites.

There has been considerable argument as to the histogenesis of the tumor. It has been variously ascribed to a neoplastic variant of adenomyosis, undifferentiated mesenchymal cells, totipotential adult cells, an abnormal growth of vascular cells, and a malignant endometrial sarcomatouslike growth.

The treatment indicated, on the basis of past experience, is total removal of the tumor and associated pelvic structures, careful observation for gross and microscopic extension, resection of recurrences, and radiotherapy. —*James F. Donnelly, M.D.*

Surgical Curettage; Its Value in Abnormal Uterine Bleeding. RALPH C. BENSON and JOHN N. MILLER. *Obst. Gyn.*, 1956, 8: 523.

IN THE LIGHT of the fact that curettage so often fails to clarify the cause of abnormal uterine bleeding while still apparently resolving the problem, the authors discuss the question of whether curettage is really worth while. With this question in mind 647 patients were analyzed, and all of them were admitted and had curettage in the University of California Medical Center in San Francisco, during the years 1951 to 1955. Excluded were all patients 50 years of age and older, those with visible lesions of the cervix, and all patients with a history of pregnancy complications and cancer-positive smears. Of the 647 patients, 323 reported significant increase in the quantity or duration of the menstrual flow (group I, hypermenorrhea). Metrorrhagia was the initial complaint in 324 women (group II). In general patients were admitted for planned curettage after anticipated ovulation, except when irregular shedding of the endometrium was expected, and curettage was then scheduled for 4 to 6 days after the onset of a regular menstrual period.

Endometrial polyps were found in 124 patients (19.1 per cent), submucous fibroids in 13 per cent, and endometrial hyperplasia in 20 per cent. There were 20 cases of unsuspected cancer (3 per cent), 12 of the cervix uteri and 8 adenocarcinomas of the fundus. It was apparent that the history of the type of bleeding provided little correlation to the histologic findings.

Immediate hysterectomy or radium therapy was employed in 28.8 per cent of group 1 (hypermenorrhea) and 11.4 per cent of group 2 (metrorrhagia).

Twenty-one per cent of the patients in group 1 and 29.6 per cent of those in group 2 were lost to follow-up before 3 months had elapsed. One hundred sixty-two patients in group 1 and 192 patients in group 2 were observed adequately, and the results on these patients are tabulated thus:

	Group 1	*Group 2*
Followed 3 months or more after dilatation and curettage (D&C)	162 =100%	192 =100%
Normal periods after D&C	78 = 48.1%	122 = 63.5%
Normal periods after D&C and hormones	34 = 21%	22 = 11.5%
Relapse	50 = 30.9%	48 = 25%

Of the patients who were not cured by curettage alone or with hormone medication, the following follow-up results were obtained:

	Group 1	*Group 2*
Relapse	50 =100%	48 =100%
Repeat dilatation and curettage	17 = 34%	11 = 22.9%
Hysterectomy	15 = 30%	14 = 29.2%
Hormone therapy and further observation	18 = 36%	23 = 47.9%

These results in a large series show that curettage alone will cure half of all patients with hypermenorrhea and two-thirds of those with metrorrhagia. The authors discuss the importance of curettage in view of the fact that so many pathologic findings are unsuspected prior to this procedure and may be missed if so-called "medical curettage" is employed and apparently cures the bleeding. The value of suction or endometrial biopsy which delivers haphazard endometrial fractions to the histologist is of doubtful value for the same reason. Cytologic techniques are unreliable in the woman with uterine bleeding except in the instances of malignant growths. Even when bleeding is dysfunctional or idiopathic, with no demonstrable pelvic pathology, curettage will clarify the picture. It is also false to assume at the outset that uterine bleeding is sufficiently explained when the patient is suffering from severe hypertensive vascular disease or other disorders, just as it is a mistake to consult the psychiatrist for "tension bleeding" until gynecologic disease has been ruled out by currettage.

—W. D. Bergman, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Contribution to the Study of Virilizing Tumors of the Ovary (Contributo allo studio dei tumori virilizzanti dell'ovaio). P. Quinto. *Riv. ital. gin.*, 1956, 39: 245.

The author's first patient was a 48 year old housewife with 4 children, who believed that the menopause had begun at the age of 46 and stated that it was accompanied by the initiation of hirsutism and other signs of a masculine habitus. At this time the patient began to complain of pains in the right lower quadrant of the abdomen. Eight months before she came to the author a tumor was discovered in the region of the right ovary and a diagnosis of cyst of the right ovary had been made.

Briefly, the studies of the hormonal excretion of the urine disclosed a significant increase in the excretion of the 17-ketosteroids and, when this urinary excretory component was fractionated by the usual chromometric methods, a significant increase of the extra-suprarenal androgens was found, that is, of the fractions 4 (androsterone) and 5 (etiocolanolone).

At operation the cyst was found in a condition of torsion on its pedicle, which explained the severe pain syndrome. A complete hysterectomy with bilateral adnexectomy was carried out. Six months later the hormonal findings had returned to a fairly normal titer and the patient had assumed an almost normal feminine habitus.

Histopathologically, the removed specimen proved to be a rather typical dermoid cyst of the right ovary with a component of what the author regarded as a corticosuprarenoblastoma. This is thought to be the first reported instance of this oncologic association.

The second patient was a 15 year old girl, also with the syndrome of virilization, a palpable tumor in the region of the right ovary, symptoms of pain, and a sensation of heaviness in the right lower quadrant of the abdomen.

On examination of the urine an increase in the 17-ketosteroids was noted, especially of the fractions 4 and 5. At operation the right ovary was found to be replaced by a solid tumor the size of a fetal head, with a yellowish pink color on cross-section and the typical histoarchitecture of the so-called sympathicotropic tumor of the ovarian hilus, that is, a Leydig cell tumor. Only about 10 cases of this type of tumor have been reported.

The patient was observed for some months and then disappeared, although the parents had been informed that the operation had not been radical and constant supervision of the patient was necessary for a long period. However, in the few months that the patient was observed she was examined frequently and a constant and quite rapid improvement in her condition was noted. The urinary hormone findings returned to normal within a few days; the hirsutism largely regressed, the previous enlarged clitoris diminishing notably in size; there was no evidence of recurrence of the tumor and after 2 months the patient again began to menstruate.

The author concludes that the urinary hormones are extremely suggestive in the matter of diagnosis; the findings are not pathognomonic, or at least not known to be pathognomonic at present. The subject of the ketosteroid fractions is in need of further study.

—John W. Brennan, M.D.

Ovarian Malignancy. H. Close Hesseltine and Robert L. Smith. *Am. J. Obst.*, 1956, 72: 1326.

From 1931 to 1943, 128 patients with ovarian cancer were treated at the Chicago Lying-In Hospital. This represented 15.4 per cent of all gynecologic malignant growths, and makes it the third most common genital cancer. The most frequent ovarian malignant tumors were serous cystadenocarcinomas (53.8 per cent), pseudomucinous cystadenocarcinomas (14.1 per cent), and Krukenberg tumors (8.6 per cent).

The overall 5 year survival rate was 20 per cent. Early surgical removal offers the best cure rate. When metastasis has occurred, the removal of the primary site seems to prolong life and make it useful and more comfortable.

—Alan Rubin, M.D.

Malignant Ovarian Tumors (Maligne Ovarialtumoren). E. HANAK. *Klin. Med.*, Wien., 1956, 11: 451.

In the period from 1930 through 1950 a total of 345 malignant ovarian tumors were seen at the Second University Women's Clinic in Vienna. The various types were distributed as follows:

Primary ovarian carcinoma	202
Carcinoma that developed into cystadenoma	110
Granulosa cell tumors	11
Dysgerminoma	3
Sarcoma	7
Hypernephroma	1
Metastatic ovarian tumor	
Classical Krukenberg	9
Other types (mammary)	2

The average age of the patient with granulosa cell tumor was 48 years. Menstrual abnormalities were found in one-half of the patients. The dysgerminomas grew rapidly but responded well to radiotherapy. None of the 7 patients with ovarian sarcoma lived more than 2 years. All Krukenberg tumors but 1 occurred in women under 50 years of age; 8 were secondary to gastric tumors, and 1 to sigmoid carcinoma.

The mean age of all the patients was 50 years. The occurrence in nulliparas or primiparas seemed to predominate (156 to 69) over that in multiparas. Late menarche was quite frequent and the genital organs tended to hypoplasia. Characteristically, there are few symptoms which makes early diagnosis very difficult. The prognosis depends upon the treatment and upon the cell type of the malignant tumor. The usual therapy was surgery and postoperative radiation.

—Warren R. Lang, M.D.

MISCELLANEOUS

Streptomycin in Advanced Pelvic Tuberculosis; Evaluation; Report of 6 Cases. M. LEO BOBROW, L. B. WINKELSTEIN, and STANLEY FRIEDMAN. *Obst. Gyn.*, 1956, 8: 299.

THE AUTHORS present and discuss 6 cases of advanced pelvic tuberculosis. Of these cases 2 followed normal full-term deliveries.

In their experience streptomycin and P.A.S. do not lead to the resolution of gross pelvic pathology although these drugs may heal endometrial and cervical tuberculosis. Streptomycin and P.A.S. are chiefly of value in the preoperative and postoperative stabilization of the patient. Preoperatively, fever and the general condition are improved; postoperatively, a spread to the skeletal and urinary systems is prevented.

Surgery is the prime method of cure, since the eradication of a tuberculous process is possible.

—Warren R. Lang M.D.

Chorioepithelioma; an Analytical Study of 28 Necropsied Cases, with Special Reference to the Possibility of Spontaneous Retrogression. P. C. HOU and S. C. PANG. *J. Path. Bact.*, Lond., 1956, 72: 95.

AMONG 3,200 AUTOPSIES performed during 7 years at the University of Hong Kong, 28 cases of chorioepithelioma were encountered.

The disease would seemto be fairly common in Hong Kong, 1 per 114 autopsies, or 1 per 3,708 pregnancies.

The mean age of the patients was 30 years, the youngest being 19 and the oldest 47. The highest incidence of the disease was between the ages of 26 and 35 years.

There was no evidence of any relationship between chorioepithelioma and parity.

The incidence of various types of pregnancy preceding the disease was, among 24 cases, 6 molar pregnancies (25 per cent), 7 abortive pregnancies (29 per cent), and 11 with full-term delivery (46 per cent).

The average survival was 6 months, the shortest being 1 month and the longest 24 months. The longest period between the onset of the symptoms and the last pregnancy was 8 years.

Metastasis was observed in the genital organs in the following order of frequency: vagina—9 cases, ovary—6, cervix—6, and vulva—6.

Distant metastasis was observed in the following organs in order of frequency: lungs—27 cases, brain—23, liver—14, kidney—12, spleen—11, small intestine—6, myocardium—5, mammary gland—3, stomach—2, adrenal gland—2, voluntary muscle—2, pancreas—1 case, and rectum—1.

Primary growths were present in the uterus in 19 cases and varied greatly in extent. When the primary growth was small or lacking, there was no parametrial infiltration, but the distant metastasis was extensive. When the primary growths were extensive and accompanied by parametrial infiltration, the distant metastases were less widely disseminated and less massive.

It is possible that both local and systemic resistance may be developed toward chorioepithelioma. Evidence of this is found in the disappearance of the primary growth from the uterus and in the inverse relationship between parametrial infiltration and the extent of distant metastasis. In one case, spontaneous retrogression of the metastasis was apparent.

The most common cause of death was hemorrhage from tumors in various situations, the order of frequency being cerebral, vaginal, gastrointestinal, and abdominal.

—John R. Wolff, M.D.

Endoarterial Choriocarcinoma of the Lung (Zur Kenntnis des endoarteriellen Chorionkarzinoms der Lunge). JUAN CARLOS AHUMADA, RODOLFO SAMMARTINO, RAÚL CHEVALIER, and FRANCISCO MARTINEZ. *Geburtsh. & Frauenh.*, 1956, 16: 743.

A THIRD CASE in the literature, of a thrombosing intravascular choriocarcinoma of the pulmonary artery, is described in this article by the authors from the Gynecological Clinic of the University of Buenos Aires.

A 50 year old multipara had a dilatation and curettage after a spontaneous expulsion of a hydatidiform mole in 1950. Persistent chorionic gonadotrophin titers gave the indication for a "radical operation" and x-radiation. The pathologic diagnosis was "mola hydatiformis endovenosa," with no sign of malignancy. Later the pregnancy test became positive again, and 4 months after surgery pulmonary symptoms (cough and chest pain) and fever appeared. Progressive pulmonary disease, with infiltration of the right lung base during the following year, led to eventual thoracotomy and pneumonectomy. The patient died 5 months after thoracic surgery and 2 years after

the diagnosis of a mole (no autopsy). The removed lung showed extensive intravascular chorioepithelial disease with thrombus formation in the main and lower branches of the pulmonary artery.

The first case of this kind, described by Lissauer in 1905, was that of a 27 year old primipara who had died suddenly of cardiac failure 2.5 years after hysterectomy for "chorionepithelioma malignum." A thrombotic neoplastic lesion, obstructing the pulmonary artery, was the only metastatic lesion demonstrated.

A second case (Wurm, 1952) was that of a 32 year old multipara, Para III, who had a normal delivery with a normal placenta in 1941, followed by persistent metrorrhagia and negative curettage findings. The patient was admitted to the hospital 1.5 years after delivery with a diagnosis of pleurisy, bronchopneumonia, and pulmonary infarct after a history of progressive pulmonary symptoms for the past 3 months. She died 2 months after admission (20 months after the last delivery). Pulmonary findings at autopsy were similar to the lesions described previously, which had produced several hemorrhagic pulmonary infarcts of varied stages. The genitalia were normal and there was no evidence of a mole in the uterus. Reevaluation of the previous curettage findings revealed a multinuclear chorionic growth in the lumen of a capillary endometrial vessel, which had originally been mistaken for a gland.

All cases are typical in the following: their uterine origin; the formation thrombosis of the pulmonary vessels with resulting infarction, pulmonary edema, cor pulmonale, and death due to circulatory failure; and their confinement inside the vessels with the absence of invasive or metastatic involvement of the lung tissue itself. The arterial thrombi were uniformly composed of clusters of Langhans' cells with plasmodial masses and coagulated blood. It is postulated that this clinical picture, with its slow progression and absence of malignant invasion, should be classified in its biologic activity somewhere between the normal trophoblastic potential and malignant chorioepithelioma. It appears to resemble the pathogenesis of endometriosis in some respects, and the term intravascular chorioepitheliosis is suggested. This picture is distinguished from endovenous hydatidiform mole by the absence of chorionic villi. —*W. D. Bergman, M.D.*

Stress Incontinence Following the Manchester Operation for Prolapse. C. O. Danielsson, C. Franksson, and I. Petersén. *Acta obst. gyn. scand.*, 1956, 35: 337.

The symptoms attending prolapse of the vagina and uterus usually include disturbances of micturition. These symptoms generally subside after operative treatment of the prolapse, but occasionally the micturition disturbances persist or are aggravated.

The authors studied 12 women between the ages of 35 and 75 years of age. All had been operated on for prolapse and all complained of stress incontinence. Eight had had stress incontinence preoperatively. The patients were investigated by urography, urethrocystography, cystometry, urinary sediment analyses, vaginal examination, and electromyographic examination of the striated urethral sphincter and the pubococcygeus muscles. In the latter method electrodes are inserted into the respective muscles, and action potentials are recorded with a cathode-ray oscillograph. Electromyographic investigation disclosed and localized lesions of the striated urethral sphincter in every one of the cases.

—*Warren R. Lang, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Disorders of the Heartbeat During Pregnancy. CURTIS L. MENDELSON. *Am. J. Obst.*, 1956, 72: 1268.

DISORDERS of the heartbeat during pregnancy are discussed by the author. He refers to published reports and to experiences encountered at the New York Lying-In Hospital.

Evidence suggests that pregnancy may increase susceptibility to premature contractions, sinus tachycardia, and paroxysmal supraventricular tachycardia. Sinus tachycardia, paroxysmal tachycardia, auricular flutter, and auricular fibrillation may precipitate congestive failure in patients with structural heart damage, and death may result.

None of the disorders of heartbeat per se, in the absence of organic heart disease, constitutes a valid indication for therapeutic abortion, hysterectomy, hysterotomy, induction of labor, cesarean section, or sterilization. Also, none of the disorders should alter accepted concepts of management related to specific underlying heart disease.

Maternal and fetal mortality associated with these disorders is due mainly, to underlying heart disease. Exceptional instances of fetal death may be related to anoxia accompanying intrapartum paroxysmal tachycardia. Not an insignificant number of maternal and fetal deaths have been due to ill-judged obstetric intervention.

None of the disorders affects the incidence of spontaneous abortion or of miscarriage, the duration of the pregnancy or the labor, the blood which is lost during delivery, or the weight and health of the newborn infant.

Quinidine and its derivatives are not contraindicated in pregnancy. When digitalis and other causes of cardiac damage are excluded, a prolonged P-R interval (electrocardiogram) should suggest rheumatic carditis. Nevertheless, the conduction time may be prolonged without other evidence of rheumatic activity and may be normal despite definite active rheumatic fever.

In pregnant women, chorea, chronic auricular fibrillation, and fatal rheumatic heart disease are not usually associated with clinically recognizable carditis or prolonged auriculoventricular conduction. Congenital heart block is frequently associated with other congenital cardiac anomalies, particularly intraventricular septal defect.

Auricular fibrillation not associated with organic heart disease, and auricular fibrillation occurring after mitral surgery can usually be reverted to normal sinus rhythm. Chronic auricular fibrillation associated with rheumatic heart disease in not necessarily incompatible with successful childbearing. The maternal hazards are those of the underlying heart disease, plus the increased tendency toward embolism and heart failure. Current advances in medicine and cardiac surgery tend to reduce these dangers.

—Alan Rubin, M.D.

Gingival Tumors of Pregnancy; Review of "Pregnancy Tumors" and a Report of 2 Cases. FRANK J. ZARKA and MARVIN M. STARK. *Obst. Gyn.*, 1956, 8: 597.

TUMORS of the gingiva occur in about 2 per cent of pregnancies. They are rarely mentioned in the obstetrical literature. The lesions are usually papillomatous with a broad base. They appear as a solitary purplish or dark red tumor, generally in the upper incisor region. Regression follows delivery but recurrence and enlargement with succeeding pregnancies is the rule. Various causes, from vitamin C deficiency to inflammatory disease, have been suggested.

The microscopic appearance is that of highly vascular, connective tissue proliferation beneath a squamous cell covering. Inflammatory alterations are absent except in the lesions which are ulcerated. Therapy consists of complete excision of the entire papilloma to the periosteum. *—George C. Lewis, Jr., M.D.*

Diagnosis of Uterine Tube Carcinoma by Vaginal Cytology. JOHN I. BREWER and A. MAYNARD GUDERIAN. *Obst. Gyn.*, 1956, 8: 664.

POSITIVE atypical vaginal cytologic smears are reported in 3 patients with tubal carcinoma. In 2 cases the malignancies were primary in the tube. In 1 it was secondary to an undiagnosed carcinoma of the pancreas. All 3 patients had a history of abnormal bleeding. Curettage of the uterus and biopsies of the cervix had failed to demonstrate uterine carcinoma in 2 of the 3 patients.

With a positive smear and negative curettage and cervical biopsy, either the latter procedures have missed the neoplasm or the malignancy is located above the uterus and is in the tubes, ovaries, or elsewhere in the peritoneal cavity. Complete medical investigation and, in rare cases, exploratory laparotomy are indicated. Either culdoscopy or uterosalpingography would usually be sufficient.

—Warren R. Lang, M.D.

LABOR AND ITS COMPLICATIONS

The Hormone Relaxin in Labor; Tocometric Studies of Its Effect on Uterine Contractions at Term. JOHN V. KELLY and NILS POSSE. *Obst. Gyn.*, 1956, 8: 531.

THE WATER-SOLUBLE nonsteroid hormone, relaxin, usually accepted to be a uterine relaxing factor and first described by Hisaw in 1926, has been experimentally used for the inhibition of uterine motility, relief of dysmenorrhea, and recently for the arrest of premature labor. Since clinical trials have so far failed to accurately measure the local effect of this drug, the authors have set out to add objective figures to our knowledge with the help of the intrauterine tocometer advised by Karlson in 1944. By this method 3 minute microcarbon receptor chambers, mounted on a thin steel probe, are placed between the uterine wall and the fetal membranes. After proper electric wiring they measure local contractile pressures in the fundus,

isthmus, and cervix separately and quantitatively. No medication was required for the insertion, and no complications occurred in any of the cases.

Twenty-five women in their thirty-ninth or fortieth week of gestation and in early labor were selected for the study. Sixteen of the patients were multiparas. The test was started when active labor was established, but dilatation had not progressed to 4 to 5 centimeters. All patients delivered without complications within 4 to 22 hours after the test was started, all infants were mature.

Realxin (releasin, Warner-Chilcott, 3,000 G.P.U., 20 mgm. or 1 c.c.) was given intravenously to all patients, and the only side effects noted were transient chills in 3 instances after the injection of 8 to 12 c.c. The dosages given varied from 0.5 to 16 c.c.; the average initial amount was 2 to 4 c.c. (40 to 80 mgm.); and the total averaged 10 c.c. or 200 mgm. The injection was usually started after about a 45 minute observation of a typical contractility pattern, and the patient was then observed with tocometric readings for another 2 hours. In only 1 of 25 patients did relaxin have a definite effect in reducing and inhibiting uterine contractions. Tocometric tracings revealed resumption of the contractions after approximately 1 hour in that patient, and repeated doses of relaxin at that time failed to produce any further effect.

The authors discuss the question of why these findings should be in such marked contrast to those in other publications which were founded on subjective appraisal only. It is possible that the effect of relaxin may be different in premature labor and by the intramuscular route. It also must be considered that the tocometer may have increased uterine irritability and thus masked the action of the relaxin.

—*W. D. Bergman, M.D.*

The Clinical Evaluation of Relaxin. CLAIR E. FOLSOME, THEODORE HARAMI, STANLEY R. LAVIETES, and GEORGE M. MASSELL. *Obst. Gyn.*, 1956, 8: 536.

THAT PROPERTY of the relaxin first discovered in animal experiments was the specific action on the collagenous tissue of the symphysial ligament. Since the cervix contains such an extensive amount of dilatable fibrous tissue, it appeared conceivable that a hormonal influence, like that acting on the symphysis, might add to the knowledge of the mechanism of cervical dilatation during its upward contraction. Fifty-eight pregnant patients were studied in this group, 40 of whom had a history of premature delivery while the others were carrying small fetuses. In 11 patients (27.5 per cent of the premature group) no known obstetric cause for premature labor was found: 9 had premature rupture of the membranes, and the rest a variety of other causes of prematurity. A control group of 50 patients in the city hospital was treated similarly with bedrest and other conservative methods, including estrogens in some cases, but excepting relaxin.

Relaxin (releasin) was administered in different dosages, and eventually the following regime was suggested: initially 80 mgms. or 4 c.c. are given intramuscularly and followed by 40 mgms. or 2 c.c. at 4 hour intervals for 48 hours following the cessation of all uterine contractions. In 5 patients releasin was used in a continuous intravenous drip of 8 to 16 c.c. per 1,000 c.c. of 5 per cent dextrose solution in distilled water. One of these 5 patients experienced a shaking chill and a transitory fall in blood pressure. The total dosage per patient varied from 80 to 2,360 mgms; to a few patients as much as 240 mgms. were given as an initial dose. In most of the patients premature labor was usually halted by the third intramuscular injection, and the more favorable responses occurred in those patients who had so-called "unfavorable" cervices, and those in which dilatation was 5 centimeters or less and effacement was 50 per cent or less. All of the patients who had antepartum hemorrhage were excluded, since relaxin is contraindicated in these cases.

In 9 of 40 patients in premature labor no significant clinical effect was noted. Uterine contractions were definitely diminished in 15 patients and stopped completely in 23 (57.5 per cent). It also appeared that amniotic fluid leakage was stopped by the administration of relaxin in the case of premature rupture of the membranes. It was further notable, that in 11 of these 40 patients ultimate labor was precipitate and practically painless.

Of 18 patients at term 5 showed no response to relaxin; 5 others had a marked decrease in frequency, intensity, and duration of uterine contractions; and 2 of the latter group actually had a secondary uterine inertia. This condition required pitocin medication later on with good results. In 7 other patients labor was effectively halted during the first stage.

In conclusion, it was apparent that relaxin was useful in halting premature labor, especially in the twenty-ninth to the thirty-second week of pregnancy, and during the early part of the first stage of labor. Deliveries were much less painful and much more often of the precipitate type. By the use of relaxin premature labor was delayed in 22 women for a total time gain of 936 additional days of gestation. The fetal loss rate, from 11 women losing 14 infants in premature labor, was 25 per cent as compared to an 86 per cent fetal loss rate in the control series of 50 patients. Thus fetal death could be reduced by 61 per cent with the help of relaxin.

—*W. D. Bergman, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Genitourinary Tuberculosis and Lithiasis (Tuberculose génito-urinaire et lithiase). R. COUVELAIRE and J. BRIZON. *J. urol. méd.*, Par., 1956, 62: 429.

THE ASSOCIATION between lithiasis and genitourinary tuberculosis, classically considered to be rare, does not seem as exceptional as it is usually thought to be. Couvelaire and Brizon have studied 765 cases of genitourinary tuberculosis and found 20 of them to be associated with urinary lithiasis, about 4 per cent. In order to establish the exact percentages, it is not only necessary to review the cases of genitourinary tuberculosis and evaluate the roentgenograms for evidence of calculi, but the patients having genitourinary stones should be examined for tuberculosis. Thus, it is necessary to examine histologically the kidneys diagnosed as presenting calculous pyonephrosis for evidence of associated tuberculosis. Among the patients who have responded to the treatment of calculus, there will be a significant number who will also have tuberculosis. Because of the relative frequency of the association between these two diseases, the authors urge that the classical idea be abandoned and that more attention be paid to the identification of the two conditions. They have separated their series of cases into three groups according to the site of the stone, i.e., the excretory tract of the tuberculous kidney, the normal kidney, and the lower urinary tract. Of 17 patients with calculi in the excretory tract of the tuberculous kidney, 13 had calculi either in the pelvis or calyces, and 4 in the ureter. There were eight calculi found in the excretory tract of the kidneys not infected with tuberculosis (or thought not to be) and four stones involving the lower urinary tract.

In the 13 patients who had calculi in the pelvis or calyces of the tuberculous kidneys, there were a great variety of clinical findings, but there also appeared to be considerable difficulty in the diagnostic association between the two diseases. In these 13 patients, tuberculosis was not evident in 3, while it was marked by the lithiasis in 10. In order to discount the popular notion of the infrequency of this association between the two diseases, the roentgenological and clinical signs of urinary calculus must be minutely analyzed, and macroscopic and microscopic examinations of the specimens removed at operation must be made in the cases in which tuberculosis may not even be suspected because very frequently the tuberculosis is masked by lithiasis. When the pyelograms are not entirely consistent with the findings of calculosis, such as the amputation of a calyx or a group of calyces, the condition of the ureter may be the key to the diagnosis. There may be an irregularity of dilatation of the pelvis or calyces that is not consistent with the finding of stone, in which case it is advisable to do guinea-pig innoculations for clarification of the diagnosis.

In 2 cases even a subsequent examination of the roentgenograms did not permit a diagnosis of tuberculosis. It was established only by a histological examination of the removed tissue; however, in 6 cases, evidence of tuberculosis was present. Five of 10 patients had to be rehospitalized because of complications thought to be due to lithiasis or renal insufficiency. In one young woman hospitalized because of arterial hypertension, the examination revealed bilateral renal tuberculosis associated with a staghorn stone in one kidney. A second patient had a perinephritic fistula following surgical drainage of the calculous kidney; the histological presence of tuberculosis was established following nephrectomy. The 3 other patients were hospitalized for the treatment of anuria; in one there was a caseous kidney and in the 2 others there was a combination of tuberculous pyonephrosis and stone. In these 5 cases, the possibility of tuberculosis associated with lithiasis had not been considered. Four patients in this series had calculi in the ureter of a tuberculous kidney. In one of the patients a small calculus migrated through a normal ureter and was spontaneously eliminated from the body, while in the 3 others, the calculi were found above a stricture in a tuberculous ureter.

In this group of patients, there were 8 in whom calculi developed in the upper urinary tract with kidneys free, or thought to be free, of tuberculosis. In 7 cases these stones were found in a solitary kidney, the other having been removed because of tuberculosis or complete destruction by caseous degeneration.

The calculi can at times be classified as secondary for they develop in an uninfected kidney and are due to tuberculous involvement of the lower urinary tract, either because of vesical or urethroprostatic pathology which causes a lithogenous reflux into the ureter (5 cases).

In addition, lithiasis in the normal kidney may be a complication of either cutaneous or sigmoid ureterostomies.

Two of the patients in this reported series developed pelvic lithiasis several months following implantation of the ureter into the colon. These 2 patients were subjected to nephrectomy for tuberculosis with transplantation of the ureter from the normal kidney into the bowel. Both patients were dead within a year. The authors point out the dangers associated with this procedure even if the transplanted ureter did not drain tuberculous urine. In one patient a pyelocalyceal stone developed following a cutaneous ureterostomy.

Calcium medication along with prolonged treatment with intensive vitamin therapy can favor metabolic lithiasis. One man, 47 years of age, developed a stone in the pelvis of the right kidney. Tuberculosis of the inferior pole of this kidney was discovered in 1946, and in November of 1953, preceded by this intensive medical therapy, a stone was removed from the right renal pelvis.

Four patients were found with stones in the lower urinary tract, 3 having stones in the bladder and one having calculous prostatitis. The genesis of these stones could be explained by sclerosis, thickening of the bladder neck, and tuberculous prostatitis.

The therapeutic indications for the treatment of a tuberculous kidney with calculus depend upon the symptoms. The presence of a stone in a tuberculous kidney should not preclude conservative therapy with conservation of renal tissue as its aim. If tuberculosis is curable without the sacrifice of the kidney, the indication for the classical operation such as pyelotomy or ureterotomy remain unchanged. When tuberculosis is limited to the polar region, a partial nephrectomy with the removal of the stones at the same time may be advisable. Tuberculosis involving the middle portion of the kidney, but superficial, may be treated by removal of the tuberculous lesion with pyelotomy for the removal of the stone.

When ureteral stenosis is present, it may be treated by conservative means, cystoscopic dilatation or resection of the strictured area of the ureter; perhaps a ureterocystoneostomy would afford good ureteral drainage.

If the renal tuberculosis is incurable by medical treatment, nephrectomy or nephroureterectomy may be the only operation that can be done.

In the patients who develop calculi in nontuberculous kidneys, the other one having been removed, it becomes quite important not only to remove the stones but to prevent, if possible, a secondary calculus from forming. In these patients extreme care should be used in determining the cause of the formation of stone, and surgery should be directed toward relief from the primary cause of the lithiasis. Attention must be directed toward the removal of strictures of the ureter as well as toward vesicoureteral reflux. Obstructions at the vesical neck must be removed and an operative procedure should be directed toward the enlargement of the contracted bladder.

It may become necessary to perform ureteroenterocystoplasty in vesicogenital tuberculosis when lithogenous reflux has taken place.

In the patients who have stones in the lower urinary tract, procedures directed toward transvesical removal of the stone or lithotripsy associated with transurethral removal of the obstruction at the bladder neck may be of value in preventing the formation of secondary lithiasis. —*Conrad A. Kuehn, M.D.*

The Biological Syndrome and the Treatment of Bilateral Adrenalectomy (Syndrome biologique et traitement de la surrénalectomie bilatérale chez l'homme). G. DELTOUR. *Acta urol. belg.*, 1956, 24: 367.

AFTER THE DISCOVERY of the synthetic corticoadrenal steroids, and in particular, cortisone, bilateral adrenalectomy did not have the previous fatal prognosis that usuallly followed this operation before effective substitutive therapy was available. Following the first observations of Huggins and Scott in 1945, the indications for adrenalectomy have increased; thus total or subtotal removal of the adrenal gland has been proposed for the following conditions.

1. Increased production of adrenal secretions due either to hyperplasia, or benign or malignant tumors of the cortex.

2. Degenerative arterial syndromes as seen in diabetes or arteritis in the young patient.

3. The hypertensive syndrome associated with malignant hypertension.

4. Metastatic neoplasms of the breast and prostate gland.

In order to understand the limits imposed in hormonal therapy associated with total adrenalectomy in cancer of the prostate and breast, the authors have outlined the biological basis for this operation. In 1889 Schinzinger suggested bilateral ovariectomy as a supplement to surgical treatment in cancer of the prostate. Huggins in 1941 demonstrated the relationship between the androgens and the favorable result on cancer of the prostate when treatment consisted of castration, either alone or associated with estrogenic therapy. The failure of castration or estrogenic therapy to produce a favorable result was thought by Huggins and Scott, in 1945, to be due to the fact that the cancer was stimulated by the androgens that came from the adrenal glands. Later, the idea was advanced by Dobriner that some neoplasms depend upon the secretions of the adrenal glands and as a result of their experiments, they determined the biochemistry of these glands. Thus, through experimental study, it has been determined that the suprarenal glands are an important relay in the development and control of breast and prostatic cancers.

The biological syndrome caused by bilateral adrenalectomy in many ways is similar to Addison's disease. It becomes necessary to administer daily doses of corticoadrenal hormones in the adrenalectomized patient in order to prevent symptoms of adrenal collapse. Classically, the loss of sodium from the body is the first sign that suggests corticosuprarenal insufficiency, thus a malaise, anorexia, asthenia, and nausea, the so-called "sodium diabetes," appears if the electrolytic balance is not soon restored. In the same manner other metabolites such as the alkaline reserve, the metabolism of calcium, the acid and alkaline phosphatase, the glucocide activity, and the protein metabolism as well as the urinary excretion of steroids must be studied for a proper evaluation of the adrenalectomized patient.

The treatment of the patient prior to bilateral adrenalectomy is started before operation by the intramuscular administration of 150 mgm. of cortisone and 50 mgm. every 6 hours. Constant evaluation of the blood pressure may show the need for the parenteral administration of DOCA. During operation, cortisone may be supplemented by the intravenous administration of hydrocortisone.

As the period following surgery may also be one of great danger, the patient should not be given excessive amounts of glucose, salt, or water. Transfusions of blood may be needed to replace the blood lost in operative hemorrhage.

Vascular collapse can be treated with noradrenalin in suitable doses, usually for a period up to 72 hours following surgery when there is the most critical need for this drug. During the first 5 to 7 postoperative days, there is a progressive decrease in the dose of cortisone required, 300, 200, 100, and then 50 mgm. being given per day first intramuscularly and then by mouth as soon as the patient is able to assimilate the drug. DOCA is not usually needed after the first 2 or 3 days to help maintain the blood pressure. Finally, sodium chloride intravenously is replaced by salt taken with the food (usually 2 to 6 gms.). Maintenance doses of

25 to 50 mgs. of cortisone by mouth every 2 days and 5 mgs. of desoxycorticosterone weekly with a normal diet and an increased sodium chloride intake would suggest a basic maintenance routine for the adrenalectomized patient.

When acute adrenal insufficiency occurs unexpectedly, rapid recognition of the syndrome and adequate treatment can reduce the danger to a minimum.

—*Conrad A. Kuehn, M.D.*

Surgery of the Adrenal Gland (Zur Chirurgie der Nebenniere). H. DETTMAR. *Zschr. Urol.*, 1956, 49: 513.

IN RECENT YEARS progress in our knowledge of the physiology and pathologic physiology of the adrenal gland, as well as the introduction of cortisone and ACTH have enhanced the success of operations on these glands. Diseases of the adrenals which may require surgical intervention can be divided into those of the cortex and of the medulla. Diseases of the cortex include adrenogenital syndrome, Cushing's syndrome, combinations of the previous two, metastasizing prostatic cancer, and metastasizing breast cancer. Diseases of the medulla requiring surgery are pheochromocytoma and essential hypertension. Six case reports dealing with various diseases of the adrenal and their surgical management are given. The clinical picture of the various adrenal diseases considered in greater detail is given in the following.

Adrenogenital syndrome. This is associated with symptoms of virilism and can be caused by tumors or hyperplasia of the adrenal cortex. It is most commonly found in children, and manifests itself as precocious puberty. The disease is 4 times as common in girls as in boys. Pseudohermaphrodism, with a marked increase in the size of the clitoris and conversion of the labia majora into a scrotum-like structure, may be found. These conditions have to be differentiated from tumors of the gonads (interstitial cell tumors of the testis in boys or ovarian tumors in girls). The 17-ketosteroids excretion in the urine may be considerably elevated. To determine whether the disease is due to a tumor or hyperplasia of the gland, 25 to 50 milligrams of cortisone are given daily. If the symptoms are due to hyperplasia the excretion of 17-ketosteroids in the urine will become considerably diminished, and this therapy is then continued until all symptoms disappear. If a tumor is present the excretion of 17-ketosteroids in the urine will not be affected. Pyelography and perirenal air insufflation are invaluable in the localization of the tumor. Adrenal cortical tumors may occur in adult women and may be associated with amenorrhea and hirsutism. The breasts may become smaller, the clitoris larger, and there may be a male distribution of hair. The excretion of 17-ketosteroids in the urine of adults may also remain uninfluenced by cortisone medication. The excretion of estrogen in the urine may be normal or slightly elevated. In most instances of this sort, benign adenoma of the adrenal gland had been found. The operative removal of these tumors is not too difficult, and marked hormonal reactions as they occur in pheochromocytoma or adrenal cortical tumors associated with Cushing's syndrome do not occur. These tumors must be handled gently for they are easily torn. Neither preoperative nor postoperative hormonal therapy is necessary. Following operation the precocious puberty recedes.

Tumors associated with excessive estrogen excretion are extremely rare and there are probably less than 20 such tumors reported in the world literature. They tend to occur most frequently in men rather than in children. Usually they are due to carcinoma with metastases. Male characteristics recede, and secondary female sex characteristics tend to appear. The penis becomes smaller; libido and potency diminish; and the breasts become larger. The excretion of estrogenic substances in the urine is increased but prolan is absent (in contradistinction to chorionepithelioma of the testis). In these cases as well, preoperative and postoperative hormonal therapy is not necessary.

Cushing's syndrome. In 1932 Cushing described a syndrome due to tumors of the pituitary (basophilic adenoma). At that time comparatively little was known about the function of the adrenal cortex. Today it is believed that in most cases of Cushing's syndrome, disease of the adrenal exists either through hyperfunction or hyperplasia or because of the presence of tumors. It is not clear whether this syndrome is due primarily to disease of the pituitary or to that of the adrenal cortex. Most symptoms of this disease can be relieved by protracted administration of ACTH which stimulates the adrenal cortex, or through large doses of cortisone or hydrocorticosterone. The treatment of this disease is based on the removal of the sources of these stimulants, namely, subtotal excision of portions of both adrenals if no tumor is present. If a tumor is found, one must make certain that the contralateral adrenal is not atrophied. The disease is caused by the excessive production of 11-oxysteroids from the adrenal cortex which can induce many metabolic disturbances, such as, moon face, hirsutism, torsal and cervical obesity, muscle weakness, impotence, amenorrhea, hypertension, diabetes, and osteoporosis, all of which might be associated with back pain. Not all of these symptoms occur in every patient and considerable variation in the clinical picture is possible. This disease occurs twice as commonly in women as in men. The size of the adrenal is not in direct proportion to the production of hormone.

As for laboratory data, the glucose tolerance test is most commonly positive, although normal blood sugar levels may exist. Some patients have severe insulin-resistant diabetes. Lymphopenia and an increase in the number of erythrocytes and of the hemoglobin may be found. In severe cases alkalosis may be present. Perirenal air insufflations do not give as good diagnostic results in this disease as in adrenogenital syndrome or in pheochromocytoma. Because of the great increase in the perinephric fat, angiograms are not much help either and should not be used. On exploration, a tumor is usually not found and it is necessary to expose both adrenals, for it is important to determine the status of the opposite adrenal. If the adrenals appear atrophic accessory adrenals must be searched for. In 3 of 4 cases, hypertrophy of the adrenal is found. In accordance with present day experience, it is best to remove one adrenal and partially resect the other.

The excision of adrenocortical tumors or the subtotal resection of the adrenals in Cushing's syndrome,

in contrast to the removal of cortical tumors in the adrenogenital syndrome, may be accompanied by serious postoperative reactions and "addisonian" crises unless steps are taken early to prevent these complications. It is, therefore, advisable to give 100 mgm. of cortisone 12 hours preoperatively and then to repeat the dose 2 to 3 hours before the operation. Postoperatively, every 8 hours 50 milligrams of cortisone are then given. The dose may be gradually reduced over a period of 4 to 6 weeks. Insufficiency of adrenal cortical hormone manifests itself in nausea, vomiting, weakness, muscular pains, stiffness, and hypertension. If these symptoms occur, cortisone therapy should be resumed. Occasionally cortisone administration will have to be continued because the remnant of the adrenal fails to function adequately. If sodium chloride levels are not maintained by the daily administration of 4 to 6 grams of salt, 1 to 3 milligrams of desoxycorticosterone daily may be helpful. The electrolyte balance must be carefully watched. Infusions of sodium chloride, potassium, or desoxycorticosterone may become necessary. The blood sugar level bears watching as well. Postoperatively, hypochloremic shock can be averted by infusions of glucose.

How much adrenal tissue to resect is difficult to tell. American authors recommend resection of up to 90 per cent of the gland.

The postoperative results after removal of benign adrenal cortical tumors is usually very good. Subtotal resections of the adrenal also can yield satisfactory results.

Mixed forms of adrenogenital syndrome and Cushing's syndrome do occur and are much more common in women than in men. In children these disease processes lead to precocious puberty and to an increased excretion of 17-ketosteroids in the urine, which are unaffected by cortisone. In many instances the adrenal is enlarged and the kidney is displaced downwards, as seen in the pyelogram. Cancer of the adrenal cortex is usually very malignant and the prognosis is poor.

Adrenalectomy in patients with prostatic cancer. In most patients castration and estrogen medication produce regression of the prostatic cancer. There are patients, however, in whom this therapy produces only transient results or is ineffective. These are due probably to differences in the biology of the tumors. It has been shown experimentally that the pituitary gland could stimulate the adrenal cortex after the removal of the gonads with resultant androgen stimulation and with an increase in the excretion of the 17-ketosteroids in the urine. Theoretically it appears possible that patients who fail to respond to castration and estrogen, because of continued androgen production, may be benefited either by hypophysectomy or by the more simple operation of removal of the adrenals. Bilateral adrenalectomy in these patients, however, creates a number of difficult problems which have not been solved as yet, and the tendency today has been to try to achieve similar results by means of cortisone. If adrenal insufficiency occurs, it must be handled as outlined above. Bilateral adrenalectomy had also been suggested for the same reasons in patients who had metastatic breast cancer, but here also improvement is only temporary.

Pheochromocytoma. This tumor of the adrenal medulla which was first described by Frankel in 1886 is on the whole a fairly rare disease and is characterized by the occurrence of hypertensive crises due to sudden outpouring of adrenalin into the blood stream. The increased adrenalin in the blood plasma produces anxiety, restlessness, hypertension, hyperglycemia, and metabolic disturbances, as well as leukocytosis with a relative eosinophilia and an increase of lymphocytes. The adrenal stimulation of the sympathetic nervous system leads to pallor, dilatation of the pupils, and cold sweats. The secretion of tears and of saliva and the motility of the hollow organs become decreased. Occasionally there is an elevation of temperature. Toward the end of the attack parasympathetic imbalance may occur and will result in blushing, profuse sweating, polyuria, contraction of the pupil, bradycardia, drooling, lacrimation, and vomiting. In some cases the clinical picture is that of essential hypertension. Patients who have a small pheochromocytoma show primarily the clinical picture of essential hypertension. The diagnosis depends to a good extent on a careful history. If, however, adrenal crises are absent, the diagnostic problem becomes difficult. Elevated blood pressure levels can be due to essential hypertension, especially at the time of the menopause. Thyrotoxicosis, nephritis, migraine, and brain tumor may have to be considered in the differential diagnosis. The differentiation between a small pheochromocytoma and essential hypertension may be exceedingly difficult. Tests utilized in the differential diagnosis, which can produce adrenal crises, are inherently quite dangerous and may lead to serious complications or to death. The histamine test (Roth, Kvale) is performed by the injection of 1 milligram of this substance subcutaneously, or as Cahill advocates it, 0.25 milligrams intravenously. This injection will produce a classical rise in blood pressure in 2 to 5 minutes if the patient has a pheochromocytoma. In patients who have hypertension for other reasons or in normal individuals, only minor elevation or even a drop in blood pressure occurs. This test, however, is not pathognomonic for pheochromocytoma and a similar reaction may occur in patients sensitive to histamine.

The tetraethylammonium bromide test introduced by LaDue and his co-workers is preferred. By injecting 100 to 300 milligrams of this material intravenously, a crisis is produced in 2 to 3 minutes which will recur when the patient is allowed to stand up. In 7.4 per cent of the patients, this test will be falsely positive.

Guarrneri and Evans introduced the acetyl-B-methylcholene test; 25 milligrams of the substance are injected subcutaneously. In 2 to 4 minutes after the injection, a positive reaction is indicated by a rise in blood pressure of 80 to 150 mm. of mercury. In normal individuals this substance produces a drop in blood pressure. This test can be utilized in conjunction with the cold pressure test. The latter is carried out by immersion of both forearms in water of 10 to 12 degrees for 60 minutes. A rise in blood pressure of about 40 mm. of mercury is suggestive of pheochromocytoma. All these tests should be carried out with the patient in the recumbent position, and for a few days before the tests are done no sedatives should be given. It goes without saying that these tests should not be under-

taken if the patient has had a crises a short while before. With all tests a syringe with 5 to 10 milligrams of regitin should be held in readiness to be used at once if dangerous symptoms appear. According to Sack and Cahill, 20 to 25 per cent of patients will have negative tests. Patients who have permanent hypertension should not be subjected to these examinations because of the grave risk involved. Testing with adrenolytic substances is preferred. The benzodioxide test proposed by Goldenberg and co-workers is of this nature. After the intravenous injection of 0.25 milligram per kilogram of body weight in the form of 2 per cent solution, patients with pheochromocytoma will have a moderate rise in blood pressure in 2 or 3 minutes followed by 50 to 70 mm. drop. If the hypertension is due to other causes, the blood pressure remains unchanged. Failures and false positive tests with this substance have also been reported.

In the diagnosis of pheochromocytoma, the preferred test today is the one with regitin. Five milligrams of this substance are injected intravenously or 5 to 10 milligrams are given intramuscularly. In the presence of a pheochromocytoma, the blood pressure will drop at least 50 mm. of mercury within a few minutes, and the fall will persist for 10 to 40 minutes. In normal individuals or those who have hypertension for other reasons, the blood pressure will drop up to 20 mm. of mercury or not at all. Toxic reactions have not been observed, but it may be wise to have some adrenalin or arterenol in readiness if the blood pressure drop is too great.

Pheochromocytoma may occur in both adrenals or wherever chromaffin tissue is present. It is not wise to subject the tumor to rough palpation, because massage of the tumor can lead to severe crises. Once suspected, the diagnosis can be made most commonly by retrograde or intravenous pyelography in conjunction with perirenal or presacral air insufflation. The latter will show up both adrenals and is less dangerous than the perirenal air insufflation, following which sudden death has been reported. If the various tests are not positive and the diagnosis is suspected, abdominal exploration may be necessary. Originally the mortality amounted to 25 per cent and the prognosis was rather poor, but with the introduction of sympathicolytic drugs the danger of the operation has diminished considerably and the mortality is now less than 10 per cent. Regitin and arterenol must be available for immediate administration during the operation. If the blood pressure drops dangerously, noradrenalin is given. Intravenous injections should continue for 2 days so that any undue severe reactions can be managed at once. If only one pheochromocytoma is present, the lumbar (retroperitoneal) approach is preferred.

Untreated pheochromocytoma leads to death in 5 to 10 years. These patients usually die from adrenal hypoplasia, edema of the lungs, cardiac insufficiency, coronary sclerosis, or from sudden unexplained causes. The paroxysmal form of the disease, if it has existed for 10 years, cannot be influenced by therapy and leads to chronic hypertension. Ten per cent of all pheochromocytomas are malignant, infiltrate the para-adrenal tissues, and metastasize.

—*S. Richard Muellner, M.D.*

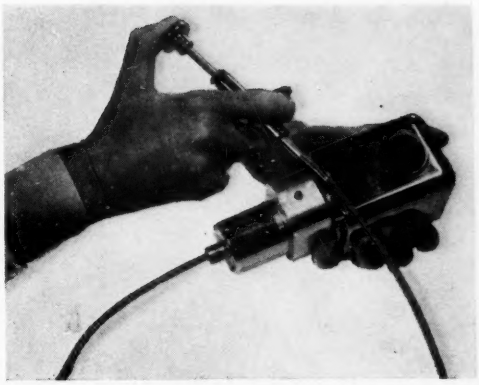


FIG. 1. (Burke). Thul-X. Aperture port facing viewer.

Isotope Radiographs for Localization of Renal Calculi During Surgery; a New Truly Portable Radiographic Unit Using a Radioisotope (Thulium 170) as an Energy Source. DONALD E. BURKE. *J. Urol.*, Balt., 1956, 76: 508.

MANY SPECIAL TECHNIQUES are described in the literature to secure roentgenographic control when operating for kidney stone. Braasch and Carmen in 1919 were responsible for advances in the surgical fluoroscopic methods of locating calculi. Beer, in 1931, used special cassettes made of aluminum and containing double intensifying screens. They were placed directly behind the wound. Other modified techniques followed. There has been, however, an outstanding need for improving operating room roentgenographic units. The problems include the high cost of equipment and installation, limitation of use to one room,

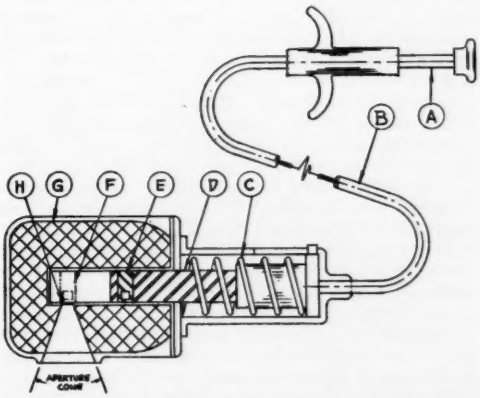


FIG 2. Longitudinal diagrammatic cross-section of Thul-X. Pressure on plunger moves cable against spring so that slide moves forward bringing thulium capsule to rest over aperture. This allows gamma rays to escape through aperture cone. *A*, Plunger; *B*, cable; *C*, spring; *D*, slide; *E*, thulium capsule; *F*, operating position of capsule; *H*, brass shield to filter harmful beta rays.

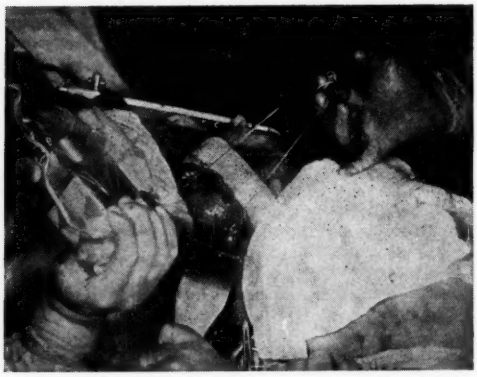


FIG. 3. Thul-X in use. Unit, encased in sterile plastic bag, is held by surgeon and "aimed" at kidney. Kidney cassette in rubber glove is behind kidney, which is here immobilized with loop of string passed around renal pedicle.

the decreased space in the operating room, and the danger of explosions with certain anesthetic gases.

The "Thul-X" unit presented by the author has a low initial cost, requires no installation, is immediately available in any room, and presents no problem of explosion since no electrical connections are necessary.

The source of energy for exposure of the x-ray film is a radioisotope, thulium 170. The use of this substance had its inception when West (1951) gave a preliminary account of its uses in experimental and industrial radiography. The development of this present unit for renal surgery follows the work of Untermyer and Hasterlik (1954) who described a small portable unit which utilized thulium 170 for its energy source and was intended for use in making radiographs of extremities. The radiation from this isotope is chiefly in the form of gamma rays which have an energy of approximately 84 kilovolts. It is this relatively low energy of the gamma rays, contained within the diagnostic roentgenologic range, and approximating the maximum photographic effect per roentgen, that makes this isotope so well suited for radiologic work.

The thulium x-ray unit, referred to as the Thul-X, weighs 7 pounds and is 9 by 7 by 6 centimeters in its gross dimensions. It is constructed of lead and surrounded by a chrome-plated aluminum shell. Except for an aperture port through which gamma rays are emitted during exposure, the isotope is shielded by 1 inch of lead. The apparatus is operated by pushing a plunger which, via cable and spring, moves a steel slide. This brings the thulium capsule to its operating position and allows the escape of the gamma rays. The release of pressure on the plunger terminates the exposure. A longitudinal diagrammatic cross section of the apparatus which clarifies the explanation is presented.

In determining the radiation dose considerable experimental work was carried out. Test radiograms were made of varied thicknesses of milled aluminum step wedges, 0.75 cm., 1.3 cm., and 2.0 cm., with 2 second exposures at 7 inches. Other experiments were made on renal calculi in vitro, calculi placed in human cadaver kidneys, and in the mobilized kidneys of dogs. The reproductions of these exposures are presented.

The radiation dose rate at the surface of the completely assembled unit averages about 75 mr./hour when loaded with a newly activated thulium 170 source. Periodic replacement of the isotope is necessary about every 8 to 10 months. A special kidney cassette designed to be placed in the wound in direct contact with the mobilized kidney is used. Sterility is maintained by encasing it in a sterile rubber glove, the open end of which is clamped with a hemostat. Sterility of the Thul-X unit is maintained by carefully dropping it into a long, autoclaved water-tight plastic sleeve. The unsterile plunger end of the cable is held by the x-ray technician. The source-film distance is 7 inches.

This unit has been used in orthopedic work, and interest has also been shown in its use in operative cholangiography. —*Allan K. Swersie, M.D.*

Benign Primary Tumor of the Ureter (Gutartiger Primaertumor des Ureters). ROLF BAUMGART. *Zschr. Urol.*, 1956, 49: 599.

BENIGN URETERAL TUMORS are extremely rare, are usually of epithelial origin, and resemble papillomas of the bladder. Even less common are tumors that arise from connective tissue. Their favored location is in the lower third of the ureter. Occasionally they will protrude from the ureteral orifice, and when they do the diagnosis will be an easy one to make. Usually, however, the diagnosis is quite difficult. Hematuria is the most common symptom. Pain may be dull and occasionally colicky. Intravenous or retrograde pyelography may suggest the presence of ureteral tumor; when it does, a saucerlike depression is seen in the negative shadow in the ureter. Nonopaque stone has to be considered in the differential diagnosis. Benign tumors may be excised locally but not uncommonly by the time the diagnosis is made there is considerable destruction of the kidney by the block, and in this case nephroureterectomy may be advisable. A case of benign papilloma in the lower third of the ureter in a 64 year old man is reported.

—*S. Richard Muellner, M.D.*

Transplantation of the Ureters to an Isolated Ileostomy. WILLIAM J. BAKER and EDWIN C. GRAF. *J. Urol.*, Balt., 1956, 76: 557.

DIVERSION of the urinary stream to an isolated ileal segment, as used by Bricker, seems ideal. Continuous contamination by the fecal stream is avoided, the occurrence of pyelitis and hydronephrosis is minimal, and since the ileal segment acts as a conduit rather than a reservoir, little or no absorption of electrolytes into the circulation is found.

The prime indication for urinary diversion is palliation when pelvic disease has interfered with urinary drainage. By the time this procedure is indicated, malignant conditions cannot be eradicated.

The authors present a group of 20 cases seen during a 2 year period. Sixteen patients had pelvic carcinoma, 2 had vesicovaginal fistulas following curative

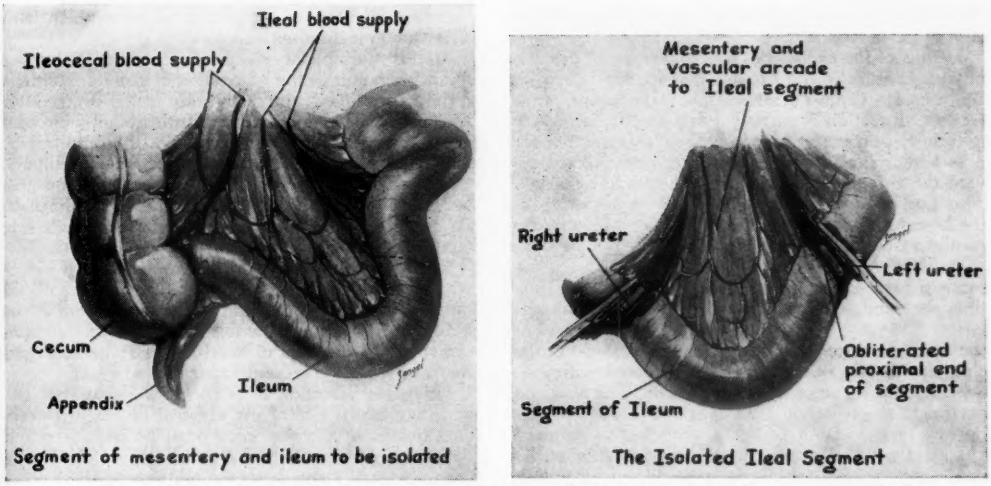


FIG. 1. (Baker, Graf). Left, Small bowel selected for ileal conduit should be approximately 7 to 8 inches from ileocecal junction. Right, Mesentery in this area has proper vascular supply to ileal segment, due to arcade type of vascular arrangement.

treatment of cervical carcinoma, and 2 were "urological cripples" after gynecologic and orthopedic operations.

Less preparation is needed for an ileal shunt operation than in a large bowel ureterointestinal anastomosis, because the fecal stream is liquid in the ileum and the bacterial count is less.

The abdomen is opened through a left paramedian incision. The ureters are exposed just proximal to the bifurcation of the iliac vessels and cut off close to the bladder. The catheters that are placed in the proximal ureters drain outside the peritoneal cavity while the ileal conduit is developed. A point is selected for the ileal conduit, where a vital artery may be preserved; it should be approximately 7 to 8 inches from the ileocecal junction. A 6 to 8 inch conduit length is ideal, because there will not be enough absorptive surface to permit electrolyte disturbance. The exact point of resection and reanastomosis is determined after the selection of a vascular pedicle from one of the branches

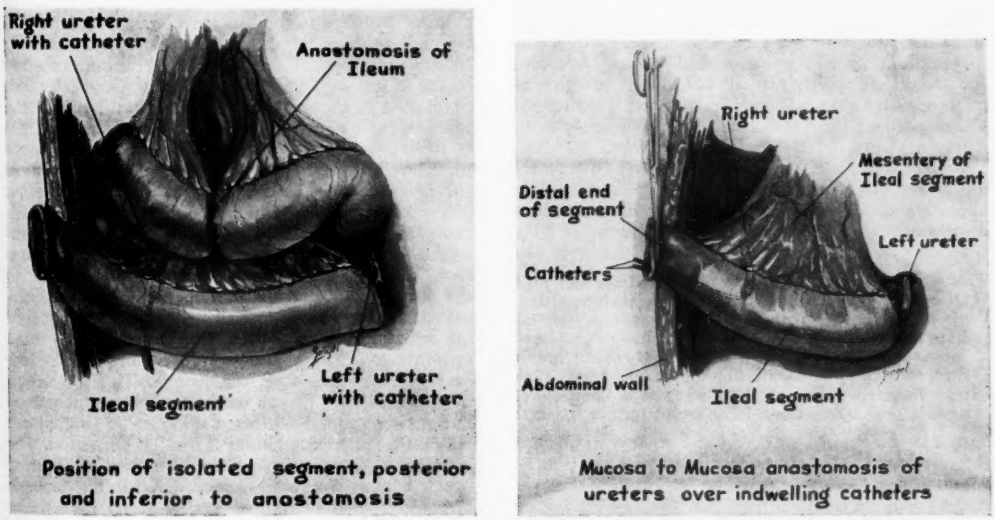


FIG. 2. Left, Cut left ureter passes back of peritoneum or through base of mesentery of large bowel and out to point where it can be anastomosed to ileal segment. Right, Both ureters are implanted on posterior side of ileal segment and ureteral catheters are brought out through ostium of conduit.

of the ileocecal artery which will give adequate blood supply.

Details of the excision of the ileal segment are discussed. Closure of the proximal end is simplified by the use of a Clute-Furniss clamp. After bowel transection, dissection is carried down on the mesentery anteriorly and posteriorly in a V-shaped manner for 3 to 4 inches; all bleeding areas are clamped to prevent the threat of viability by hematoma formation. This degree of dissection will permit anastomosis of the bowel above the conduit without undue pressure on the vascular V-shaped pedicle.

While a routine type of open, small bowel anastomosis is used to restore continuity of the small intestine, the conduit is laid aside to determine its vascularity. If everything is in order, the proximal end of the ileal segment is closed over the Clute-Furniss clamp with No. 00 catgut and reinforced with No. 6-0 black silk for serosal approximation. The terminal portion of the segment is brought out through a McBurney type incision in the lower right abdominal quadrant and below the reanastomosed portion of the small intestine. Both ureters are usually implanted on the posterior side of the conduit by a mucosa-to-mucosa anastomosis. The intra-abdominal portion of the conduit is sutured to the posterior peritoneum and mesentery of the sigmoid. All denuded retroperitoneal areas are closed to prevent hematoma. The ureteral catheters are brought out through the skin ostium and removed after 1 week. A catheter with a 5 cubic centimeter retention bag is then placed in the conduit and irrigated at intervals with saline to maintain patency and remove mucus.

The postoperative course varies. Most of the patients have a stormy course with postoperative ileus.

In this series of 20 patients there were 3 postoperative deaths; one was due to bronchopneumonia, a second to generalized peritonitis possibly caused by failure to close the denuded retroperitoneum, and the third also because of a generalized peritonitis stemming from a colostomy which had slipped back into the peritoneal cavity. In all of these, the ureteroileal hook-up was without leakage or obstruction. Other patients died as a result of their disease or of causes not immediately related to operation.

A table lists the clinical findings in 7 survivors after a postoperative period of from 6 weeks to 2 years. The operative techniques are clarified by diagrammatic illustrations. —*Allan K. Swersie, M.D.*

The Restoration of the Ureter After Resection and Diversion of the Urine Through Contralateral Implantation of the Ureter; A Study Based on Animal Experimentation (Die Wiederherstellung des Harnleiters nach Resektion und die Harnableitung durch kontralaterale Harnleiterimplantation; Eine tierexperimentelle studie). WOLF LUTZEYER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 283: 316.

THE MANY technical methods and their variants for the restoration of ureteral continuity suggest that as yet no perfect method exists. The end result of ureteral surgery will vary depending upon whether the injury to the ureter is acute or chronic. It will depend also upon the functional status of the kidney, on the degree and on the type of any associated urinary tract infection, and on the experience of the surgeon with a particular technique.

In this study based on animal experimentation, the following points in the restoration of ureteral continuity are considered: the restoration of the ureter after resection of its abdominal segment through a circular end-to-end anastomosis with and without splinting; by means of prostheses; through organ transplants; by means of circular end-to-end anastomosis and prolonged splinting with a plastic catheter; and implantation of the ureter into the ureter of the opposite side (transureteroureteral anastomosis with splinting).

Many years ago Marion had shown that a ureter which was cut across and carefully repaired would not function and would lead to the destruction of the kidney. This, however, is not true today as has been shown by the reports of Wildbolz, Hryntschak, and the author's own animal experiments.

Following resection of portions of the ureter, the variation in the size of the ureteral lumen in the reanastomosis of the two ends must be considered. If the anastomosis is completed under tension, the lumen becomes smaller and the functional result will be poor. For the evaluation of the success of ureteral anastomosis, the excretory urogram is valuable.

The anatomy of the ureter of the dog, its blood and lymphatic supply are quite similar to that in man. Ureteral peristalsis depends on a number of factors which are transmitted partially through the vegetative motor nerves and through autonomic ganglia, and in part also through the direct effect of the urinary stream on the muscle cell. Whenever a ureter has been totally sectioned or when it has been permanently constricted by scar or inflammation three choices are available to the surgeon. First, the restoration of the urinary flow to the bladder; second, the diversion of the urinary stream; and third, nephrectomy of the corresponding kidney. The restoration of urinary drainage to the bladder can be accomplished through reunion of both ureteral stumps according to any number of techniques: by reimplantation of the distal segment into the renal pelvis, by implantation of the proximal ureteral segment into the bladder, or by reimplantation of the ureter into the contralateral ureter. In any case, the anastomosis must be completed without tension. In some instances this can be accomplished by a downward dislocation of the kidney which is then fixed in its lowered position. Diversion of the urinary stream can be accomplished to the skin or to the bowel. Both procedures have disadvantages. Implantation of the ureter to the skin probably results in longer survival. Ureterointestinal anastomosis sooner or later leads to ascending infections of the kidney and eventually to renal atrophy, to acidosis, and to hyperchloremia. Whenever possible, therefore, reanastomosis of the ureter by suture should be the method of choice. Removal of the kidney on the affected side can be carried out only if the remaining kidney is in good condition. The problem of restoration of the sectioned or injured ureter is most commonly encountered in gynecologic operations such as radical hysterectomy (Wertheim operation). Ureteral injuries occur in 1 to 3 per cent of gynecologic operations. The ureter is either inadvertently sectioned or ligated.

In the author's animal experiments the sectioned ureters were reunited end-to-end by means of No. 0000 arterial silk according to the method advocated by Gross for arterial suturing (FIG. 1). This technique must be carefully executed and inversion of the ureteral stump into the ureteral lumen must be avoided. Even in skillfully executed anastomoses of the ureteral ends it is important to protect the suture line by means of splinting with a catheter. This catheter should not remain in place more than 8 days. If the catheter is left in too long the suture line may become more densely scarred. The catheter must fit easily in the ureteral lumen. A catheter that is too thick can produce pressure necrosis of the ureter.

In the author's experiments the animals were observed for a considerable period of time postoperatively and the functional status of the kidney was determined by intravenous urography. In addition to the splinting, antibiotics such as 200,000 units of penicillin and 0.5 gram of streptomycin were given daily after the operation. The results of the circular end-to-end anastomosis without splinting of the ureter were not at all as good as those in which the ureter had been splinted. Without splinting a dense stricture formed at the point of anastomosis, hydroureter and hydronephrosis ensued, and a number of animals developed pyelonephritis. Some animals also developed urinary fistulas. All of these complications could be avoided by the use of a splint. There was no question, therefore, that the end-to-end anastomosis of the ureter with splinting gave superior results.

Experiments in which the ureteral defect was bridged by means of prostheses of various kinds yielded consistently poor results. These prostheses consisted of tubes made of polyethylene, polyvinylchloride, and vitallium. In all instances the prosthesis was extruded and ureteral continuity could not be restored. In some experiments the prosthesis was encased in a fascial sheath but this also was useless. The results were uniformly bad. Urinary fistulas occurred regularly and the kidney on the affected side suffered progressive and complete destruction.

The re-establishment of the ureteral continuity through organ transplants, i.e., segments of vessels such as of arteries or of veins was equally ineffective. The transplant was invariably lost, and the kidney destroyed. At autopsy, in place of the transplant a very thick scar with a markedly hydronephrotic kidney was found. It is safe to conclude that organ transplants invariably undergo necrosis. The end-to-end anastomosis of the ureter, in cases in which a portion of the ureter is lost, is best accomplished by freeing the kidney and fixing it in a lower position so that the anastomosis can be performed without tension. The site of the anastomosis must then be protected by splinting with an indwelling catheter.

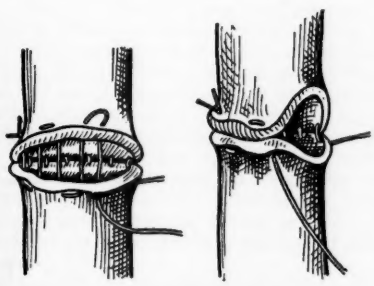
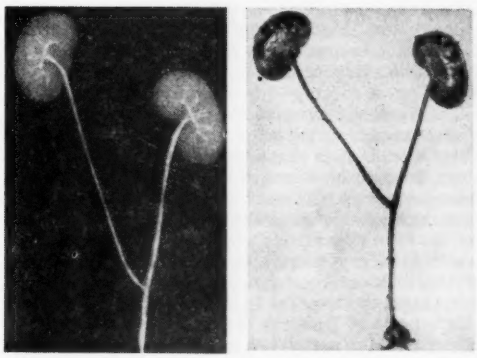


FIG. 1. (Lutzeyer).



FIGS. 2 and 3. Implantation of one ureter into its mate.

Implantation of one ureter into its contralateral mate, because of destruction of its distal end, or because of unilateral ureterovaginal or ureterocutaneous fistula, has been successfully performed in man. This procedure was carried out in 5 dogs. The right ureter was sectioned and its abdominal portion was brought across the midline and implanted end to side with an everting suture of No. 0000 arterial silk. The ureteroureterotomy was splinted in such a way that the catheter extended from the right renal pelvis across the midline through the lower portion of the left ureter. The results of this operation were very satisfactory (FIGS. 2 and 3). In the past the fear had been expressed that failure of such an operation in man might lead to jeopardy of the good kidney. The author believes, however, that the success of this operation depends entirely on a meticulous technique, and that if done carefully a well functioning anastomosis with preservation of both kidneys can be achieved.

—S. Richard Muellner, M.D.

BLADDER, URETHRA, AND PENIS

An Extremely Rare Case of Neurogenic Tumor of the Penis (Sur un cas très rare de tumeur neurogène du penis). G. BARINA. *J. urol. méd.*, Par., 1956, 62: 245.

A 51 YEAR OLD PATIENT was hospitalized for complete acute vesical retention of the urine. For some time he had been having diminution of the force of the urinary stream, with diurnal and nocturnal pollakiuria. There was palpable a small painless nodule at the base of the penile shaft. The tumor was firm in consistency, nut-sized, and occupied the anterolateral surface of the penis. It gave the impression of penetrating the corpus cavernosum.

A biopsy specimen led to the histologic diagnosis of neurilemmoma, or neurogenic tumor.

Following a suprapubic cystostomy the tumor was exposed and removed together with the involved corpus cavernosum. Now after more than 5 years there is no evidence of recurrence or metastasis and the patient is entirely without symptoms.

The histologic examination disclosed the presence of an extremely varied cellular and fibrillar structure. There were islands characterized by coarse bands of fibers, frequently arranged in network fashion, all being frequently contained in irregular neuromatous bundles. Some of these bundles were almost like normal nerve in appearance and surrounded by a dense neucleofibrillar sheath which was easily differentiated with metachromatic stains.

In places there was observed an acidophilic center with whorls of fusiform elements, frequently with hyperchromatic nuclei, but without evidence of mitosis. Some of these fusiform fibroblasts were double the normal size with a voluminous nucleus, either single or double. There could be differentiated rare lymphocytic cells which tended to be grouped about the thick-walled blood vessels. There were no areas of necrosis; merely some evidence of edema more or less dissociating the tumor components. The diagnosis was neurilemmoma in the sense of A. P. Stout (*Surg. Gyn. Obst.*, 1947, 84: 101), which the author, however, designated "ganglioneuroma," but which in an earlier article (*Am. J. Cancer*, 1935, 24: 751) he designated "neurilemmoma."

The most characteristic finding which the author describes is the palisade arrangement of the cells, which is generally viewed as evidencing a lack of malignant tendencies. —*John W. Brennan, M.D.*

GENITAL ORGANS

The Hemorrhagic Syndrome of Carcinoma of the Prostate (La sindrome emorragica da carcinoma della prostata; contributo clinico). A GALEONE and A. M. PELOCCHINO. *Minerva med.*, Tor., 1956, 2: 875.

THE AUTHORS' PATIENT was a 75 year old man. His first symptoms consisted of hemoptysis of about a half liter of blood. Under coagulant therapy the bleeding stopped after 24 hours, but in a few days the patient experienced an extensive subcutaneous extravasation of blood over the anterior chest wall and right shoulder region. There was no blood in the urine or feces. The phosphatase tests were normal or only slightly elevated. The prostate was moderately increased in size, not easily distinguished from the surrounding tissues, painful on pressure, and of increased firmness. Its surface was rather irregular to palpation and the median sulcus was obliterated.

A month after the appearance of the symptoms diffuse, intense, continuous pain developed, most severe in the region of the spinal column but also present in the extremities and about the iliac crest. The stained smear of a specimen obtained from the medulla of the right iliac crest established the diagnosis of carcinoma. Numerous nests of atypical epithelial cells were noted. Roentgenograms confirmed the presence of metastases in the spinal column, pelvic bones and ribs. Pain in the long bones of the extremities and evidence of an incipient paraplegia appeared later.

Under vigorous estrogen treatment the bone pain disappeared in the course of 10 days, but neurologic signs of spinal cord involvement persisted. The patient's condition continued to decline and he died 6 months later. Autopsy confirmed the diagnosis of prostatic carcinoma with multiple bone metastases.

Early in this patient's illness the only sign which was marked and constant enough to suggest the condition present was the increased lysis of the coagulum, or fibrinolysis of the type described by Cosgriff and Leifer (*J.Am.M.Ass.*, 1952, 148: 462). The authors interpret the condition as a parahemophilia, and believe the most important factor causing the bleeding was a deficiency of the coagulation Factor V of Owren, which they consider identical with the Ac-globulin accelerator factor of Ware, Guest, and Seegers (*J. Biol. Chem.*, 1947, 169: 231), and possibly identical with the so-called labile factor of Quick.

—*John W. Brennan, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Osteoid Osteoma. ROLAND BARNES. *J. R. Coll. Surgeons Edinburgh*, 1956, 2: 144.

THE LESION consists of a small nidus of osteoid tissue and newly formed bone; it is highly vascular and rarely exceeds 1 centimeter in diameter. Radiographically, the lesion is seen as an oval area of translucency with a variable amount of perifocal sclerosis of the bone.

The clinical features are those of dull aching pain of 3 to 12 months' duration, with the pain becoming progressively worse. If the lesion is near a joint, a concomitant limitation of motion results. Tenderness and tumefaction with muscular atrophy are noted.

Osteoid osteoma is essentially a tumor of childhood (8 to 19 years) and is predominant in the male (2 to 1). All bones, with exception of the skull, have been involved by the lesion, but in the great majority of cases, the tumor has been found in the femur, the tibia and the fibula. The lesion is often confused with a localized abscess of the cortical bone, chronic sclerosing osteitis (Garré), glomus tumor, and enostosis.

The prognosis is inconsequential. It is a self limited disease and no apparent stigmas may be perceptible beyond the third decade of life.

The author has encountered 7 cases of osteoid osteoma at the University of Glasgow in the last 3 years. He has reported 3 cases in detail. All of the patients were male; their ages are 8, 15, and 18 respectively. The involved bones were 2 in the fibula and 1 in the neck of the femur. The treatment of choice, according to this investigator, is surgical extirpation of the nidus. The sclerotic bone surrounding the lesion was left undisturbed. All the patients were rendered free of symptoms. —*Samuel L. Governale, M.D.*

Osteoid Osteoma and Sclerosing Osteomyelitis; Two Distinct Clinical Entities (Osteoma osteoide ed osteomielite sclerosante; due entità cliniche definite e distinte). I. F. GOIDANICH and R. ZANASI. *Chir. org. movim.*, 1956, 43: 427.

TWENTY-ONE INSTANCES of osteoid osteoma are reported from the Rizzoli Orthopedic Institute of the University of Bologna. Some of these were seen before Jaffe's publication appeared in the *Archives of Surgery* (1935, 31: 709) and were consequently not diagnosed as cases of osteoid osteoma. All of the cases are described in the original text with roentgenographic, photographic, and histophotographic reproductions.

In 19 patients the first symptom was pain; in 1 patient there was never pain, and in another swelling was the first symptom. Tumefaction was present in 18 cases, febrile reaction in 3, local heat in 8, edema in 6, reddening of the skin in 5, and venous dilatation in 1 case.

The interval between the occurrence of symptoms and examination varied from 5 months to 5 years. Nine patients had been given antibiotics (usually streptomycin, occasionally penicillin) without benefit; 7 had been immobilized in plaster casts without benefit. The sedimentation rate in all patients in whom it was estimated was within normal limits. Leucocytosis was not present. The Wassermann test was positive in 1 instance.

The roentgenologic and histologic findings have been described so often that it would seem sufficient to say that they were typical of osteoid osteoma in all of these instances.

Two instances of sclerosing osteomyelitis are also described. The findings were typical of chronic sclerosing osteomyelitis and, aside from the clinical and roentgenologic aspects, did not resemble osteoid osteoma. Careful histologic studies are essential to differentiate the two conditions.

—*John W. Brennan, M.D.*

Acute Suppurative Arthritis. MELVIN B. WATKINS, ROBERT L. SAMILSON, and DANIEL M. WINTERS. *J. Bone Surg.*, 1956, 38-A: 1313.

FIFTY-ONE CASES of acute joint infection have been studied in the New York Orthopedic Hospital, Columbia-Presbyterian Medical Center by the authors between 1934 to 1955. Notwithstanding the advent of the present antibiotic ancillary treatment, the results achieved in this clinic differ very little from those achieved without a chemotherapy in a previous era. Gonococcal arthritis is not included in this report.

Of the 51 cases 30 were males and 21 females. Thirteen patients were under 1 year of age, 9 were 1 to 6 years of age; hence, 43 per cent of the acute suppurative arthritic joints were encountered in children under 7 years of age. The knee joint was afflicted in 19 (37 per cent) and the hip in 18 patients. The organism, isolated by aspiration or arthrotomy, was the Staphylococcus aureus in 18 patients (35 per cent) and the Streptococcus in 12. In one third of the patients numerous bacteria were recovered from the involved joint.

Diagnostic criteria were established by aspiration and culture of the offending organism. No antibiotics were administered until bacteriologic studies were completed. Muscle spasm, increased local and constitutional temperature, and occasional capsular distention, elicited roentgenologically, were some of the consistent clinical signs of the disease. In the differential diagnosis, acute synovitis and monoarticular rheumatoid arthritis must be ruled out. Invariably, joint aspiration settles these disputable possibilities.

The treatments used by the authors consisted of arthrotomy and drainage in 37 cases, and of aspiration and local instillation of a broad spectrum antibiotic in 14 others.

The complications were pathologic dislocation of the hip in 8 of 18 patients, subsequent osteomyelitis of contiguous bones in 20 (39 per cent), coxa plana in 1, and spontaneous ankylosis in 4. The 8 deaths reported were due to septicemia.

The end results achieved by the authors were alleged to be excellent in 54 per cent, good in 21 per cent, fair in 4 per cent, and poor in 20 per cent of the cases treated by aspiration only. In the 37 patients who had arthrotomy the results were slightly less optimistic.

The article contains tables, x-ray reproductions, and statistical data. —*Samuel L. Governale, M.D.*

Osseous Coccidioidomycosis; a Chronic Form of Dissemination. J. W. BIRSNER and SCOTT SMART. *Am. J. Roentg.*, 1956, 76: 1052.

OSSEOUS COCCIDIOIDOMYCOSIS occurs as a dissemination of the disease. The authors believe it is a self-limiting disease and rarely fatal unless there is also a generalized systemic dissemination. A series of 18 cases, followed from 4 to 24 years, is presented. The series is given in tabular form and reports of patients which illustrate the disease in more detail, are added. Bony lesions are well shown by roentgenograms.

Many instances of patients with systemic dissemination of coccidioidomycosis have been seen and reported. The cases presented are limited strictly to the chronic form of osseous coccidioidomycosis. Eight of the patients had no demonstrable pulmonary pathology at the time of the onset. In the other 10 patients there was no subsequent fibrosis, hilar adenopathy, or cavitation; only 1 patient had a residual solid coccidioma of the lung. It was impossible to prove osseous coccidioidomycosis by direct inoculation.

Skin tests are of little value in diagnosis. Positive complement fixation tests helped determine the diagnosis. In one case exploratory operation was necessary to establish a diagnosis. Biopsy and smears or cultures from abscess drainage are important.

The sites of predilection were: (1) distal portions of the extremities, (2) bones of the trunk, and (3) facial bones. All types of treatment were used. There is, in the authors' opinion, no satisfactory fungicide. Surgical excision or amputation may frequently produce a good result. Involvement of bone is believed to be hematogenous rather than by direct extension. The most favorable prognosis may be expected when only 1 or 2 bones are involved.

—*Donald C. Geist, M.D.*

Intra-articular Cyst of the Lateral Meniscus (Intraartikulaere Zyste des lateralen Meniskus). JÖRG BÖHLER. *Zschr. Orthop.*, 1956, 88: 65.

THE AUTHOR describes the case of a large intra-articular cyst of the lateral meniscus in the knee joint. The patient had been complaining of pain in the knee for the past 4 years. The pain was worse on hyperextension of the leg. On admission an arthrogram was taken with 80 c.c. of air and 2 c.c. of ioduron solution which were injected into the joint cavity. A round defect in the femoral condyle which originated from the pressure of the cyst was demonstrated. On exploration of the knee joint the cyst was found to be located in the anterior horn of the lateral meniscus close to the intercondylar eminence. The cyst measured 2 cm. in diameter. There was a longitudinal tear of the lateral meniscus which measured 15 mm. On histological examination a cystic degeneration of the meniscus was found.

In conclusion the author suggests that in every case of meniscus cyst the knee joint should be explored and the meniscus inspected for tear.

—*George Wichman, M.D.*

Synovial Hemangioma of the Knee Joint. ALEXANDER E. BRODSKY. *Bull. Hosp. Joint Dis.*, N. Y., 1956, 17: 58.

THE AUTHOR presents the report of a case of synovial hemangioma of the intermediary type which involved the knee joint. A review of the literature reveals the rarity of the lesion and the difficulty of making a correct preoperative diagnosis.

Microscopically, hemangiomas of the knee do not differ from those occurring elsewhere in the body and are classified as cavernous, capillary, and telangiectatic. Jacobs and Lee have classified those occurring about the knee as (1) juxta-articular, (2) intra-articular, and (3) an intermediary type which involves both the extra-articular and intra-articular tissues of the joint.

The completely intra-articular tumor is usually a well circumscribed, lobulated, and apparently encapsulated tumor mass attached to the synovial membrane by a pedicle of varying size and adherent to the synovium on one or more surfaces by separable adhesions. Most commonly they are found in the anterior compartment of the knee where they can frequently be palpated as a small or medium-sized doughy mass preoperatively.

In some of the cases that occurred in adults, extensive hemangiomatous involvement of one leg had been present for many years with a resultant hypertrophy and an increased length of the involved extremity, presumably caused by an increased blood supply in the region of the epiphyses.

The usual history is one of repeated episodes of swelling with varying degrees of pain, often incident to mild trauma starting early in childhood. The swelling and pain usually subside with bed rest or immobilization, and normal activities are resumed.

In children recovery is relatively complete between attacks of hemarthrosis due to hemorrhage from the tumor, and the patient becomes free of symptoms in the interval. However, as adult life is reached, varying degrees of permanent disability are encountered as secondary changes appear within the joint; the changes are due to repeated hemarthrosis with erosion of the articular cartilages and irregularity of the joint surfaces. These changes were frequently mistaken in the past for tuberculous or hemophilic arthritis.

The consensus in recent years is that treatment should be surgical; results are excellent when operation is performed sufficiently early in life, before degenerative changes ensue. —*C. Fred Goeringer, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Management of Hematogenous Pyogenic Osteomyelitis. JACOB KULOWSKI. *Surgery*, 1956, 40: 1094.

OSTEOMYELITIS may be divided into the following types. (1) In the abortive type the disease has not progressed beyond the stages of bacterial seeding with abatement of the local and general invasion. The abortiveness can take place spontaneously or by early

therapy. (2) The arrestive and/or nonsuppurative lesion is one in which the local defensive mechanism has prevented the evolution of widely disseminated osteomyelitis; hence, the lesion is localized and nonsuppurative. The management of the arrestive type is immobilization and surgical interference only when overt aggressiveness of the lesion is noted. (3) The treatment for suppurative osteomyelitis is surgical when actual exfoliation of a sequestrum is imminent. The author prefers the Orr's type of treatment.

Careful analysis of 72 cases, quoted by the author, convinced him that early surgical therapy in any type of osteomyelitis is attended by a high morbidity and a prohibitive rate of mortality. The advent of chemotherapy has indubitably altered the outcome and management of hematogenous osteomyelitis. This approach, however, is fallacious in the cases of chronic osteomyelitis and bone abscesses.

—Samuel L. Garvernale, M.D.

A New Surgical Technique for the Treatment of Volkmann's Contracture (Nouvelle technique chirurgicale orthopédique applicable au traitement du syndrome de Volkmann.) L. LEMPEREUR. *Acta chir. belg.*, 1956, 55: 565.

A TECHNIQUE FOR FIXATION of the wrist with residue of Volkmann's contracture is described. Through a dorsal approach a cortical tibial graft, 10 cm. long, is inserted in a groove created in the dorsal surface of the radius, the dorsal surface of the scaphoid, and the nonarticulating surface of the base of the second metacarpal.

The wrist is immobilized at 130 degrees of dorsiflexion and the thumb is held in a straight line with the axis of the forearm.

According to the author some degree of mobility remains after this fixation. The operation is very beneficial for improving the function of the hand and fingers.

—Joseph C. Mulier, M.D.

The Surgical Treatment of Scoliosis (Die operative Behandlung der Skoliose). MAX LANGE. *Zschr. Orthop.*, 1956. 88: 41.

THE AUTHOR reviews the European as well as the American literature on the surgical treatment of scoliosis and discusses the indications for it. Idiopathic scoliosis is divided into the infantile and adolescent types. The former appears before the patient is one year of age and is usually benign in development. The latter is divided into 5 subgroups depending on the location of the curvature. The dorsal and dorsolumbar curvatures are characterized by a marked tendency to progress and should always be considered for early fusion. This is true especially when the curvatures appear before the tenth year of life and increase despite conservative treatment. Also paralytic curvatures which cannot be controlled with conservative treatment should be fused early. The extent of fusion is determined in the individual case after several roentgenograms have been taken (sitting, lying, and extension views).

The treatment consists of 3 stages, conservative, surgical, and postoperative. The first phase is begun with exercises of the spinal muscles and hyperextension exercises in Ducroquet's apparatus. A cast is applied which incorporates the arm on the convex side of the curvature and the leg on the opposite side. After maximum correction of the curvature has been obtained, a hyperextension cast is applied in which the spine is extended as much as possible. The final cast is bivalved and used for the postsurgical period.

In surgery each type of curvature should be considered individually with regard to the type of fusion to be used. Postoperatively, the original cast is changed in 2 to 3 months and the patient is fitted with a corset (cast jacket). In 6 months the corset is replaced by a steel brace.

In the last 10 years 147 patients with an average age of 17 were treated. The youngest was 12, the oldest 41. In 63 patients metallic fixation of the area to be fused was used.

All of these patients had paralytic curvatures which were progressing. In 84 patients only bone was used for fusion. Two showed progression of the curvatures despite the fusion; in the rest, however, the results were satisfactory. The best time for surgical treatment appears to be between the ages of 13 and 16 years. Costectomy should be done in older patients, but only for cosmetic improvement, not for correction of the scoliosis.

In conclusion the author states that with surgical treatment the prognosis of scoliosis has become better in recent years. In younger patients the progression of the curvature can frequently be prevented, and in older patients pain may be relieved by fusion.

—George Wichman, M.D.

Changes in the Fresh Autogenous Whole-Thickness Skin Graft Used as Interposition Material in Arthroplasty of the Hip Joint on Cats; Preliminary Report. KAUKO KETTUNEN. *Ann. chir. gyn. fenn.*, 1956, 45: 193.

EXPERIMENTAL STUDIES were carried out on adult cats to determine the changes occurring in fresh autogenous whole-thickness skin grafts used as interposition material in hip joint arthroplasty.

The hip joint was opened with the conventional technique and the interarticular cartilage of the hip joint was removed. A fresh autogenous whole-thickness skin graft was inserted into the hip joint with the epidermal side next to the freshened surface of the acetabulum. The femur was placed in its former position, the hip joint was closed and the extremity was immobilized. The cat was allowed to move about freely after 2 weeks. After an observation time of 10 to 90 days, the animals were sacrificed and the whole acetabulum was removed, fixed, stained, and examined.

The experiments have shown that the transplanted skin graft retains its vitality. About 10 days after operation, granulation tissue appears and develops into a tendon-like connective tissue which acts as an organic layer replacing cartilage between joint surfaces.

—Donald C. Geist, M.D.

The Pathogenesis and Treatment of Slipped Femoral Epiphysis in Children (Zur Pathogenese und Therapie der jugendlichen Hueftkopfloesung). G. IMHÄUSER. *Zschr. Orthop.*, 1956, 88: 3.

ON REVIEWING THE LITERATURE on slipped femoral epiphysis in children the author was impressed with the extremely poor end results of treatment which

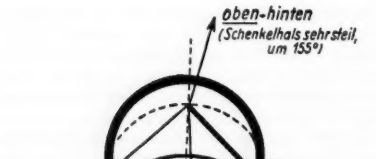


Fig. 1 (Imhäuser). Calculation of the displacement of the epiphysis.

have been reported in his own country and abroad. It seems that the pathogenesis and the morphology of the disease are poorly understood and hence lead to ineffective treatment.

Anatomically, it appears that the obliquity of the femoral epiphysis predisposes it to shearing forces and slipping. Since it has been observed that the closure of other epiphyses is frequently delayed, a hormonal imbalance has been considered responsible for the disease. The beginning stage (preslipping) may well be recognized on the roentgenograms and shows generalized decalcification of the head and neck of the femur and widening of the epiphyseal line. These changes precede actual slipping, as one of the author's cases demonstrated. Histologically, decreased ossification of the osteoid tissue, vascular hyperemia, and islands of uncalcified cartilage in the metaphysis have been described.

Slipping of the epiphysis may occur in 4 directions: posteroinferior, anteroinferior, superoposterior and inferoposterior. The posteroinferior slipping is the most frequent one and occurred in 87 per cent of the author's cases. In all of these patients there was an increase of the femoral neck angle bilaterally, even when the slip occurred on one side. The studies on resected specimens and autopsy material revealed that the end position of the slipped femoral epiphysis is caudal and posterior. There is a hypertrophic cervical ridge, which can be seen on the roentgenogram. It is considered responsible for the limitation of flexion in the hip joint.

In order to determine how the head of the femur arrives at the end position described, the author took routine true anteroposterior views and Löwenstein lateral views in all of his cases. He found that the angle between a line drawn through the axis of the femur and the epiphysial line is normally 90 degrees, but it decreases ventrally when the slip of the epiphysis occurs. By the determination of this angle the author calculates the displacement of the epiphysis (Fig. 1).

In the first stage of the displacement the metaphysis becomes soft and crumbles posteriorly under the pressure of the head of the femur. When the epiphysis touches the intertrochanteric fossa, the end position is reached. In this stage healing or slipping in the oblique plane may occur. When slipping occurs, is can be recognized by serration of the ventral aspect of the neck of the femur. At none of the described stages is there a separation between the epiphysis and the diaphysis. Healing follows the same laws as it does in fractures and may occur in any of the described stages. Clinically, the deformity is recognized by external rotation contracture of the involved extremity and positive Drehmann's sign (external rotation on forceful flexion of the leg). Of 34 patients 30 per cent had bilateral slipping. In 2 patients acute slips were observed, which were accompanied by sudden pain and acute contractures of the involved limbs.

The review of treatment is based on morphological and pathogenetic considerations. The consolidation of a slipped epiphysis may be secured by osteosynthesis or epiphysiodesis. Closed reduction should be tried only in acute cases. An osteotomy through the neck or subtrochanteric osteotomy can correct only mild deformities. In order to correct the deformity effectively the author devised an osteotomy with which caudal depression and rotation of the femoral head are corrected. He achieves this result by removing an anterior wedge from the intertrochanteric region of the neck. Seventeen cases are reported with good end results, the longest follow up being 5 years. The technique of the operation is described in detail. Roentgenographic reproductions of the successful results are included in the original article.

—George Wichman, M.D.

FRACTURES AND DISLOCATIONS

Unusual Sequela Following Pinning of a Medial Clavicular Fracture. Victor Kremens and Frank Glauser. *Am. J. Roentg.*, 1956, 76: 1066.

The authors report an interesting case of a 50 year old German born baker who suffered fractures of both the medial and distal extremities of the left clavicle on May 1, 1954. A reduction was expertly executed with two Steinman pins. Approximately 1 month later the patient experienced a pain in the neck and coughed up an intact Steinman Pin, measuring 50 millimeters. The remaining pin was removed a short time later to avert a similar occurrence. No untoward complications were reported by the authors from the migration of the pin into the trachea and its expulsion via the trachea.

Evidence is rapidly accumulating that the insertion of pins, wires, and many other gadgets is not an innocuous procedure. An appropriate discussion of the subject is accompanied by interesting x-ray pictures in this brief presentation.

—Samuel L. Governale, M.D.

The Migration of a Fracture-Transfixing Pin from the Humerus into the Mediastinum. Michael Burman, Sol Grossman, and Stefan Rosenak. *Am. J. Roentg.*, 1956, 76: 1061.

An occasional skeletal retaining pin, used in the treatment of fracture, may become migratory. The movement of the pin is alleged to be in a straight line path of its original course; the mechanism is either muscular or gravitational. Gravitational movement

usually is made possible when osteoporosis ensues and after the fracture has healed.

The authors present 2 cases of their own and quote 2 additional cases from the literature. The first case from the Hospital for Joint Diseases was a woman, aged 40, who underwent a fusion of a pagetoid hip with 4 threaded Telson pins on May 29, 1944. Five months later, the patient returned with a complaint of irritation of the bladder. Vaginal examination disclosed a pin situated below the symphysis pubis. Roentgenologic studies confirmed the presence of a pin in the prevesical region. The migrating pin was removed through a channel in the neck of the femur.

The second case was a woman, aged 85, in whom there was a mediastinal migration of a wire used to immobilize a fractured humerus. On June 7, 1953, the well reduced fracture was immobilized with 4 pins. The patient was rehospitalized approximately 6 months later with a history of fever (102.4), bloody expectoration, pain in the shoulder, and an enlarged heart. An x-ray film of the chest showed that the pin had migrated to a position anterior to the esophagus and above and posterior to the heart. Fluoroscopy revealed a movement of the pin with each systole of the heart. The patient was treated medically, and the symptoms abated without removal of the pin. She was rehospitalized subsequently for congestive failure from which she died.

Of the two additional cases reported in the literature one was a man, aged 27, who sustained a right acromioclavicular dislocation. Two Kirschner wires were inserted in the shoulder. Seven weeks later one of the wires had migrated into the lung. The wires were removed and recovery was achieved. The second case was of a 16 year old girl who had 3 wires inserted in the right shoulder. After 4.5 months one of the wires had migrated into the right lung. The removal of the wire 1 month later resulted in an uneventful recovery.

—*Samuel L. Governale, M.D.*

Supracondylar Fractures of the Elbow in Children; Treatment to Prevent Volkmann's Syndrome (Fracturas supracondileas del codo en los niños; sindrome isquemico agudo; su tratamiento; profilaxis del Volkmann). CARLOS E. OTTOLENGHI. *Prensa med. argent.*, 1956, 43: 2473.

NINETEEN SUPRACONDYLAR FRACTURES were operated upon within 14 hours after the accident. In all of the cases there were vascular complications and frequently evidence of nerve damage. In all the cases the fracture healed perfectly and recovery of function was complete.

In the earlier cases the author's management was as follows: traction was applied to the elbow and no reduction attempted. If after 30 minutes to an hour symptoms of acute ischemia persisted, the patient was operated upon. The fascia was opened by dividing the lacertus fibrosus, any hematoma was evacuated, and the vasculonerve bundle leading to the forearm explored. It was freed of all compression by dividing fascia and muscles if necessary.

An exact reposition of the fracture fragments was not attempted; the arm was suspended with traction on the olecranon. The young patient could be kept in this position as long as 30 days.

The author has met considerable opposition to his insistence on immediate operation on these fractures, but he believes that with any other treatment a certain number of Volkmann contractures cannot be avoided and that his method of treatment offers the greatest security for the patient.

These 19 cases comprise 5 per cent of all the supracondylar fractures (372 cases) observed on his service.

—*John W. Brennan, M.D.*

Fractures of the Leg on Two Levels (Les fractures de jambe a double étage). J. M. BONVALLET and P. LACHARTRE. *Sem. hôp. Paris, Ann. chir.*, 1956, 32: 989.

FRACTURE OF THE LEG on two levels is mostly due to motorcycle accidents. The intermediate fragment may vary in length between 4 and 14 cm. There may be a displacement at one or both fracture sites.

Because of the poor blood supply of the intermediate fragment, slow union is the rule and nonunions occur frequently.

The damage to the soft tissues and especially the skin requires special care. Conservative treatment is indicated when there is only slight damage to the soft tissues. Immediate reduction with skeletal traction and fixation with a plaster cast is carried out. Treatment with continuous skeletal traction is contraindicated.

Only in cases in which sufficient alignment cannot be obtained by closed reduction is open reduction performed. An intramedullary nailing with two pins in "Eiffel tower" fashion is very often the best procedure. When there is severe damage to the soft tissues and extensive tearing of the skin and subcutaneous tissues off the deeper fascial planes ("decollement"), a large incision for the evacuation of blood clots and devitalized tissues is made even when the fracture is a closed one. In these cases an immediate internal fixation of the fragments with screws or intramedullary nails seems to save the soft tissues from irreparable necrosis. In cases of secondary open reductions and nonunions a long inlay graft bridging the intermediate fragment is used. An anatomical alignment is not necessary. In some cases with nonunion of the femur and tibia an intramedullary fixation through the knee joint immobilizing the three fracture sites is used.

—*Joseph C. Mulier, M.D.*

Fractures of the Calcaneum, 59 Observations; Surgical Indications Based on Tomography (Les fractures du calcanéum; a propos de 59 observations; indications opératoires basées sur la tomographie). P. DECOULX, J. P. RAZEMON, and M. DUCLOUX. *Acta orthop. belg.*, 1956, 22: 484.

LATERAL ROENTGENOGRAMS of the calcaneum are insufficient. Only by the use of tomographic technique for anteroposterior views is it possible to visualize subtalar lesions, valgus of the heel, and fracture lines in the sagittal plane. Views are taken of the region of the external malleolus between planes 4 and 6.

When the displacement is minimal, the angle of Böhler only slightly decreased, and only a few fracture lines are visible, a walking cast is applied. When the roentgenograms show an important displacement but no destruction of the cancellous bone or cortex, a surgical procedure may be performed.

In cases of very serious damage nothing but a walking cast is used.

Of 59 patients there were only 15 operated upon, and the techniques were chosen on the basis of the roentgenographic findings.

The surgical interventions aim at reduction of the valgus of the heel, and the impaction of the thalamus (subtalar graft, nailing screw, or bolt fixation arthrodesis).

The authors review the results of 22 cases with a follow up longer than one year and conclude that there is a definite place for surgery in cases of fracture of the calcaneum, but the treatment remains difficult and the prognosis uncertain. Anatomical reductions are not always followed by good results.

—Joseph C. Mulier, M.D.

Large Foreign Body Cyst with Migration of a Smith-Petersen Nail. RAYMOND J. TERRAFRANCO, ALLAN ZELLIS, and ROMAN BABYN. *Am. J. Roentg.*, 1956, 76: 1070.

THIS ARTICLE concerns itself with a case report of a migrating Smith-Petersen nail over a period of 3 years. Perusal of the literature failed to disclose a similar case, but many other foreign bodies have been discovered to migrate. Among the most interesting cases was one in which shrapnel, lodged in the left side of the face, was found in the left hand 5 years later (Rose). Another reported by Christie was that of a knitting needle which had been inserted in the vagina 3 years before it was recovered in the left buttock, surrounded by a cystic mass.

A white male, 75 years of age, was admitted to the Orthopedic Clinic of Gallinger Municipal Hospital, Washington, D. C., on December 9, 1948, with a fracture of the right neck of the femur. A Smith-Petersen nail was employed for fixation. The convalescence period was uneventful and he returned to his original occupation at the end of 5 months. Approximately 1 year later he noted a tumefaction in his right thigh. In 1952 or 4 years postoperatively, he slipped and sustained a spiral fracture of the middle third of the shaft of the femur. On readmission to the same clinic a huge, noninflammatory, cystic mass of his right thigh extending from groin to the knee was discovered. X-ray examination disclosed, not only the fracture, but the presence of the previously inserted Smith-Petersen nail in the anterolateral aspect of thigh, several inches above the supracondylar area of the femur. A preliminary aspiration of the diffuse swelling showed the contents of the cyst to be fresh blood and cystic fluid. Diodrast was injected and roentgenologic studies yielded overt evidence of a multilocular, adventitious cyst of the thigh, caused by the migration of a Smith-Petersen nail that had been inserted 4 years previously. The amount of cystic fluid recovered was 10,000 cubic centimeters. Biopsy of the cystic fluid and tissue did not reveal any malignancy. Several other aspirations during the period of his hospitalization yielded progressively lesser amounts. The fracture, per se, was treated quite adequately with a Thomas splint. Union was observed at the end of 80 days, at which time he was discharged. Recovery and functional restoration were assessed as excellent by the authors. Photographs and pertinent roentgenographic reproductions accompany this interesting article.

—Samuel L. Governale, M.D.

ORTHOPEDICS IN GENERAL

The Effect of Staples and Longitudinal Wires on Epiphysial Growth; an Experimental Study. ROBERT S. SIFFERT. *J. Bone Surg.*, 1956, 38-A: 1077.

THE ADVANTAGES of the temporary retardation of epiphysial growth by staples are enumerated. This method is preferred to the formal epiphysial closure by the Phemister method unless the patient is close to the age of bone maturity and maximum retardation is desirable.

In the rabbit experiments the medial distal femoral epiphysis was stapled. Even though only one staple was inserted, a rather marked deformity, due to retarded growth, was observed on the stapled side. The clinically evident bowing of the rabbit legs was confirmed by x-ray studies.

Stapling was found to inhibit the longitudinal growth by prohibiting the resting epiphysial cartilage cells from proliferating and replacing the more mature cells of the cartilaginous plate. These later cells underwent hypertrophy and degeneration in spite of the lack of replacement. The degenerating cells of the plate were invaded by vascular channels, with a resultant thinning of the layer and a subsequent obliteration by epiphysiodesis. The new bone which formed was observed to condense on the metaphysial side of the plate.

In a second group of rabbits the ephiphysis was crossed by wires of various diameters; 2 crossed wires were also used. In a control group of animals drill holes were used but the wires were left in place. Autopsy on these rabbits at 2, 4, and 6 weeks showed that transepiphysial wiring did not interfere with the longitudinal growth. No foreign body reaction was seen about the wire tracts. There was no sign of an endothelial-like lining between the wire and the bone. As the epiphysial plate grew away from the wire, the pathway left by the wire was replaced by bone rather than by cartilage. The author suggests that such a transepiphysial plug of bone might offer sufficient strength to prevent further slipping of a slipped upper femoral epiphysis. The crossed wires also had little or no effect on bone growth.

Drilling and curetting produced an epiphysiodesis. If these were centrally placed no gross deformity was produced. However, deformity did take place when the bone growth took place eccentrically. In transepiphysial wiring the need for wires of small diameter is stressed. These should be placed as centrally as possible, and if more than one wire is employed they should be symmetrically placed.

—D. Keith McElroy, M.D.

Combined Nerve and Tendon Injuries in the Hand and Forearm. VINTON E. SILER. *Am. Surgeon*, 1956, 22: 764.

WHEN TREATING acute injuries to the hand and forearm, good results can be expected only when each step is performed with care. First aid, for example, should include the application of a clean or sterile dressing and enough compression to control hemor-

rhage. In most instances, examination of the extremity, distal to the site of injury, will give sufficient information as to the extent of the injury without having to examine the wound. The more detailed examination of the wound should be left for the operating room with the patient fully prepared for an operation.

Injury to the median nerve can be established preoperatively by testing the motor function of the thumb and by eliciting loss or presence of sensation in the index finger. Loss of abduction of the small finger indicates an injury to the motor branch of the ulnar nerve. Adduction and abduction of the fingers serves as another simple, yet reliable, test for ulnar nerve function. Loss of sensation to the small finger indicates damage to the sensory portion of the ulnar nerve. The diagnosis of tendon division can readily be made by testing for specific muscle function.

The treatment accorded the injured part depends upon several factors: one of these is the zone in which the injury has occurred; another is the time interval between the injury and the surgical care. Zone 1 extends from the metacarpophalangeal joints distalward; zone 2 begins at the distal border of the transverse volar carpal ligament and goes to the metacarpophalangeal joints; and zone 3 is proximal to the transverse volar carpal ligament. If the time interval is less than 6 hours, the wound is converted into a clean, surgical wound and treated accordingly.

Should primary repair be indicated, the best surgical techniques are followed. This repair is done in a bloodless field and includes: (1) conversion of a contaminated wound into a clean surgical wound; (2) removal of all dirt and foreign material from the wound; (3) débridement of all devitalized tissue from the wound; (4) insurance of complete hemostasis in the wound; and (5) accurate anatomic reconstruction of divided nerves and tendons.

Tendons are sutured with fine interupted silk sutures after the method of Koch, Mason, and Allen. Nerves are similarly approximated with fine interrupted silk sutures. The extremity is immobilized in a position of flexion for injury to the volar structures, so as to remove tension from the suture line. Chemotherapy is recommended routinely for the acutely injured patient.

Between the years 1941 to 1955, 107 patients with combined nerve and tendon injuries were treated. Seventeen cases (16 per cent) fell in zone 1; 19 (18 per cent), in zone 2; and 69 cases (64 per cent), in zone 3. Of the 107 patients, 94 (88 per cent) had primary repair; the 13 other patients (12 per cent) were subjected to secondary repair or they declined this treatment.

The results of operation in the series are classified either as good or poor. The good results demonstrate at least 75 per cent or more normal function of the involved hand. A poor result had less than 75 per cent normal function of the involved hand. There were 73 patients (82 per cent) with good results, and 16 (18 per cent) with poor results.

Careful study of the data confirmed the clinical impression that poor results were obtained when primary repair was attempted within the flexor tendon sheath of zone 1.

A table is included which represents each case, the zone of injury, the structures divided, and the results obtained. —*William B. Stromberg, Jr., M.D.*

Spontaneous Rupture of Extensor Tendons in the Hand Associated with Rheumatoid Arthritis. Lee Ramsay Straub and Edward H. Wilson, Jr. *J. Bone Surg.*, 1956, 38-A: 1208.

In 1896 rupture of the extensor pollicis longus was described by Düms as drummer's palsy because of its high incidence among members of the German army drum corps. At first mistaken for a paralytic condition, it was soon recognized as a true rupture caused by chronic synovitis associated with attritional changes in the body of the extensor tendon.

During the past 30 years, the most frequently reported spontaneous ruptures of tendons in the hand have been those associated with fractures of the distal end of the radius. Infection and degenerative joint changes have also been reported as etiologic factors. In addition, spontaneous ruptures have been described as occurring in association with rheumatoid synovitis and as a result of long-standing rheumatoid arthritis of the inferior radioulnar joint.

The tendon (extensor pollicis longus) passes medially to Lister's tubercle close to the junction of that prominence with the dorsal carpal ligament. At this point it curves sharply in a lateral direction to become the dorsal boundary of the anatomic "snuff-box" before entering the thumb. Most of the ruptures occur in the carpal tunnel adjoining Lister's tubercle or just proximal to this area.

Seven case reports with illustrations are presented. The lesions in the first 5 cases represent a unique group of spontaneous tendon ruptures. It is believed that these lesions resulted from (1) attritional change in the tendon as a result of rheumatoid synovitis; (2) attrition due to age; and (3) increased mechanical wear and tear due to the prominence of the distal end of the ulna. Spontaneous rupture is not rare.

The authors believe that spontaneous tendon rupture is not rare in the arthritic hand but is probably overlooked because of the severity of other deformities in these patients.

Satisfactory results were obtained by tendon repair combined with resection of the distal end of the ulna. —*C. Fred Goeringer, M.D.*

Popliteal Cyst; a Clinicopathologic Survey. R. Joe Burleson, William H. Bickel, and David C. Dahlin. *J. Bone Surg.*, 1956, 38-A: 1265.

Of 198 patients with popliteal cyst who were seen during a 10 year period, 82 underwent 83 operations (total excision) for their cyst. The patient usually had complained of a mass and of aching pain in the region of the knee. More than a fifth of the 82 patients were less than 16 years old. Although other disease of the knee joint, which was associated with the cyst in 45 per cent of the 198 patients, apparently did not predispose to recurrence of the cyst after operation, it did seem to increase the chance that the patient would continue to complain of trouble with the joint after operation.

At operation, 46 of the 83 cysts seemed to arise from bursae, 26 from hernias, and 11 from indeter-

minate sites. Communication of the cyst with the joint was evident in 54 instances, 27 of the cysts being hernial in origin, 22 bursal, and 5 indeterminate. Failure to close the capsule when the cyst communicated with the knee did not seem to predispose to recurrence.

The authors believe that lateral-view roentgenograms are diagnostic in more than 60 per cent of the cases and suggestive of the condition in an additional 19 per cent. However, they were not able to determine, on the basis of the position of a cyst as revealed by x-ray examination, whether it was bursal or hernial in origin. Neither was it possible, by routine x-ray observation, to determine whether a cyst communicated with the joint space. Pneumoroentgenography might aid in such a determination, but this procedure was not employed in this series, nor is it believed to be of sufficient clinical value to justify its use.

It was not of practical value to classify the popliteal cysts on a microscopic basis since it did not help in determining their origin or the likelihood of recurrence. The microscopic examination may, however, give important information, such as that which would lead to a diagnosis of pigmented villonodular synovitis or tuberculosis, or it may suggest other specific infections such as brucellosis.

Pathologically, the cysts were classified as (1) fibrous, (2) synovial, (3) inflammatory and, in a few instances, (4) transitional. No particular type of cyst or lining characterized either the bursal or the hernial cyst.

Only 5 patients had recurrence of the cyst but 27 had persistence of some degree of symptoms, 21 of whom had associated disease involving the knee joint.

"Popliteal cyst" seems preferable to the names used heretofore, regardless of where the cyst arises, since all these lesions apparently (1) behave alike clinically and pathologically, (2) have the same indications for treatment, and (3) terminate similarly.

Suprapatellar Tubular Skin Graft in the Reparative Surgery of the Lower Extremity (Il tubulo sovrarotuleo nella chirurgia riparatrice dell'arto inferiore). I. Forni. *Chir. org. movim.*, 1956, 43: 461.

Ten cases are reported in which a suprapatellar tubular type of skin graft recommended by Pick (*Surgery of Repair*. J. B. Lippincott Co., 1949), was employed at the Rizzoli Orthopedic Institute of the University of Bologna. Six other patients have also been operated upon and are now in the process of healing.

In all of the 16 patients the lesion to be covered by the graft was in the lower portion of the leg or about the ankle and heel. In all but one case the graft retained its vitality. There was a temporary disturbance of circulation in one instance. In 2 female patients the sutures of the tube gave way. This complication seems to be particularly likely to occur in women with an abundant panniculus adiposus.

The width of the graft should be between 4 and 7 cm. It is difficult to suture a graft less than 4 cm. wide into tubular form, and if it is more than 7 cm. wide it is difficult to bring together the skin margins beneath the flap. In the lower leg a larger graft will seldom be necessary. The length of the graft may be between 10 and 14 cm.

The functional damage to the knee joint is temporary. After 20 days the knee joint regains its full capacity for flexion. The resulting scar is inconspicuous.

—*John W. Brennan, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Neurologic Complications of Aortic Surgery. HERBERT D. ADAMS and HERMAN H. VAN GEERTRUYDEN. *Ann. Surg.*, 1956, 144: 574.

THE RESPONSES of the spinal cord and of the extraspinal nervous system to ischemia are not well understood. It is certain that simple acute occlusion of the blood supply does not explain the changes which occur, nor does the variation in the anatomy of the blood supply account for damage or lack of damage when certain portions of the aorta are occluded, resected, or replaced. The recent development of such surgical maneuvers has demonstrated both our lack of knowledge and the limitations which serious nervous damage has placed on that type of surgery.

A tabular presentation is made of data concerning 99 patients in whom spinal and peripheral nerve injuries occurred after surgically produced ischemia. The data, culled from many published reports, are analyzed to form the body of the authors' present article.

When the spinal cord alone is damaged, the destruction of lower motor neurones produces the chief defects: weakness or paralysis, from the sacral to as high as the middorsal segments, most seriously manifested as paraplegia. Sensory damage is less serious, and is variably manifested. Complete motor recovery may occur during the immediate postoperative period; if not then, it will never occur.

Less well known are the ischemic injuries to the peripheral nerves which follow prolonged occlusion of the lower aorta. The injury, serious enough in some cases to cause paraplegia, may be more marked in the peripheral nervous tissues than in the other tissues. The absence of soft tissue gangrene in patients with saddle aortic embolism who become paraplegic, albeit temporarily, led to the misconception that the injury was in the spinal cord. The neurological clinical findings often resemble those of cord injury, including those of the bladder and rectal dysfunction. However, careful study of more recently available material has shown that spinal cord injury results only from occlusion of the aorta above the renal artery level, or from interruption of thoracic arteries or those of the upper lumbar segment. Occlusion of the aorta below the renal vessels may cause peripheral nerve damage, but not injury to the cord.

In all cases of cord damage the duration of the occlusion exceeded 18 minutes 40 seconds. The lack of damage from briefer periods of occlusion in all cases or from longer periods (different authors have varying recommendations for the safe period). in many cases indicates the resistance of the spinal cord to hypoxia. The factors of resistance are the degree of hypoxia, the duration of it, and the speed of establishment of the collateral circulation to the parts of the cord deprived of their main arterial supply.

The anatomy of the circulation of the spinal cord is reviewed (FIG. 1). The old concept of a continuous

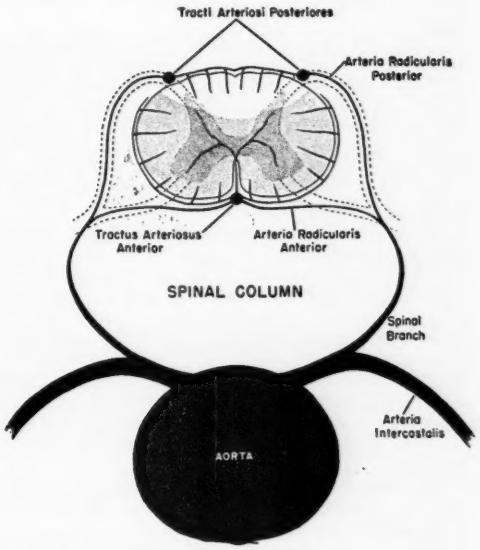


FIG. 1 (Adams, Van Geertruyden).

system of anterior and posterior spinal arteries must be revised. There are anterior and posterior arterial tracts which are fed from above by constant branches from the upper parts of the vertebral arteries, and inconstant branches from the lower vertebral arteries, the intercostals and the lumbar arteries. The anterior tract is continuous, but the posterior is not. During development of the tracts the radicular supply undergoes desegmentation, such that only a few radicular vessels remain, which become progressively larger as others regress. In the lower thoracic and lumbar parts usually 2 radicular arteries exist: in half the cases the superior artery enlarges and the inferior one regresses (in these cases there is a smaller number of important radicular arteries caudad to the prominent cervical vessels); in the other half, the lowest artery becomes most important, the arteria radicularis magna, and the cord above it has a larger number of small radicular vessels. The occurrence of paraplegia after lumbar aortography may be explained by the position of the arteria radicularis magna; the likelihood of its receiving a large dose of the contrast medium would vary according to that position.

The pattern of desegmentation of the radicular arterial supply in man depends on the level of origin of the great radicular artery. In half the cases it supplies only the lower fourth of the cord; in the others it supplies the lower half. Similarly variable is the role of the subclavian arteries.

The anatomic pattern suggests reasons for successful and rapid collateralization in some cases and failure

in others. In some cases the occlusion of the thoracic aorta below the subclavian artery is the cause for changes when the subclavian contributions are inadequate, in other cases the arteria radicularis magna may be occluded, and in yet others both factors are effective.

When the great radicular artery is infrarenal, interruption of the thoracic aortic segmental supply probably will not injure the cord. It should be noted that when this vessel has an infrarenal origin, it may ascend five segments to enter the cord. Thus, the safety of infrarenal aortic occlusion does not depend on the ascent of the cord in the spinal canal, but on the existence of a good radicular supply from above when the great radicular artery arises low.

On the basis of the previous information the occurrence of spinal cord injuries during the resection of isthmic aortic coarctation needs special explanation. The massive collateral artery network in these cases affects only the upper thoracic and lower cervical cord. The pattern of supply to the lower cord is the same as in other persons. Therefore, when a stenotic, hence a blood-bearing, aorta is occluded the lower cord is deprived of that flow and will suffer unless the collateral vessel in the lower regions is adequate soon enough, just as it must be in any case of aortic occlusion.

The importance of the systemic blood pressure during the occlusion of the aorta has not as yet been determined.

The younger person, although vulnerable, seems to be protected against ischemic damage to the cord by a better developed cranial contribution to the arterial tracts of the cord rather than by a greater resistance to anoxia. Furthermore, degenerative arterial disease does not occur to the same degree in youth, to cause defective collateral circulation.

Hypothermia will protect the nervous tissue from the effects of hypoxia. It is not known whether it delays the development of the collateral circulation as well. When the hypothermia ends, the increased demand for oxygen may not be met by the available flow to the cord. Indeed, in discussing this paper, Julian cited a case in which resection of the thoracic aorta was carried out during a state of hypothermia. Paralysis of the legs and body occurred during the reheating phase of the condition.

—Leonard D. Rosenman, M.D.

The Retrograde Flush Procedure in Embolectomy and Thrombectomy. E. Stanley Crawford and Michael E. DeBakey. *Surgery*, 1956, 40: 737.

Embolectomy in peripheral arteries such as the distal popliteal artery and its branches is often unsuccessful because of the narrowing of the vessel at the site of closure of the arteriotomy and the spasm accompanying the procedure which results in thrombosis. The opportunity for a successful embolectomy with conventional methods is considerably restricted by the high incidence of thrombosis that occurs both distally and proximally to the occluding embolus within a few hours of the accident.

Employing the retrograde flush technique of Lerman and associates in 11 consecutive patients, the authors completely restored normal circulation and prevented amputation in 10 of the 12 involved extremities. Arterial occlusion was caused by emboli in 6 patients and by thrombosis in 5. The embolus was located in and beyond the distal popliteal artery in two extremities, at the bifurcation of the common femoral artery in 3 patients, and at the aortic, iliac, common femoral, and popliteal artery bifurcations each in 1 patient. The duration of embolization prior to operation varied from 2 hours to 5 days. Thrombosis occurred during operation in 3 cases, proximal and distal to a thrombosed popliteal aneurysm in 1, and postoperatively in 1 case.

The procedure, described in some detail for small emboli from the distal popliteal artery or one of its branches as well as for removal of an embolus from a larger artery and the distal thrombus, consists in inserting a cannula into the artery distal to the occlusion and, through the cannula, forcibly injecting physiologic saline solution toward the embolus or thrombus. The clot is forced upward to an opening which has been previously made in an artery of sufficient size in which closure can be accomplished without inviting thrombosis. A free flow of saline from the arteriotomy site after the clot has been removed is evidence that the distal artery is unobstructed. Considerable emphasis is placed upon the force with which the saline solution is injected.

A previously occluded vessel between the cannula and the embolus or thrombus, or a nonviable part distal to the embolus preclude the successful application of this procedure. These conditions existed in the 2 cases of failure. *—J. Herman Mahaffey, M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Some Preoperative Warnings of Potential Operating Room Deaths. JAMES E. ECKENHOFF. *N. England J. M.*, 1956, 255: 1075.

CAREFUL STUDY of the circumstances surrounding the deaths of surgical patients has proved profitable in defining groups of patients who are candidates for catastrophe in the operating room or in the immediate postoperative period. Many of the hazards involved are generally recognized and understood. Others may be apparent if the anesthetist, surgeon, or internist studies the problem before operation. In a final group the mechanism of the complication is obscure, and forewarning comes only from previous experience. This report classifies these hazards and relates certain experiences encountered by the anesthesia service of a large university hospital over the period of the last 10 years, during which time approximately 150,000 anesthetics have been administered. The following are the hazards produced by improper preparation of patients for anesthesia and operation.

Presence of food in the stomach. Deaths from aspiration of vomitus are reported with discouraging regularity. The interval between the ingestion of food and anesthetization can not be fixed and 4 to 5 hours may be sufficient. If anesthesia is necessary in the presence of a full stomach the patient's stomach should be emptied preferably by vomiting. A Levine tube will not satisfactorily empty the stomach. When vomiting can not be induced the procedure should be delayed or regional or local anesthesia used.

Apprehension. Patients who fear death or operation have died when by ordinary standards they should have survived. Special attention should be given the apprehensive patient. Discussion of the procedure and judicious sedation should be used to allay fear.

Hypovolemia. Patients with neoplastic or ulcerative lesions of the large bowel; those who have been bedridden, or in body casts for long periods; elderly patients who have led a sedentary existence; patients who have had extensive fluid loss; and those who have had multiple operations are usually found to have hypovolemia. These are the patients who develop sudden and alarming hypotension during surgery and are unable to compensate for serious blood loss. It is wise to transfuse these patients before surgery if their apparent blood deficit is large.

Fever and dehydration. Convulsions are likely to occur in children when they are anesthetized in the presence of fever and dehydration. In their presence it is far safer to spend an hour hydrating the patient in preparation for surgery.

Preoperative drug therapy. Cortisone, chlorpromazine, promethazine, reserpine, or the tranquilizing drugs may affect the patients' ability to withstand operation, and these patients require special handling. It is well for the anesthetist to inquire into the drug habits of the patients.

Failure to alert the anesthesiologists to previous anesthetic difficulties. Patients with previous respiratory or circulatory complications during anesthesia may face these problems at a subsequent operation and it is imperative that the anesthetist be aware of the previous difficulties.

The following are the hazards produced by preexisting disease unrelated to contemplated surgery.

Angina pectoris with or without infarction, cardiac arrhythmia, and heart failure. The cardiovascular is the system most influenced by stress. In patients with any of these problems the most careful teamwork between the anesthetist, the surgeon, and the cardiologist is required.

Chronic respiratory disease. Emphysema makes it difficult to administer anesthetics because of the poor gas exchange and the increased secretions. Bronchial asthma contraindicates the use of thiopental, cyclopropane, morphine, and curare because of the possibility of bronchospasm. Chronic respiratory obstruction can often be a source of trouble by becoming acute. An endotracheal tube can overcome such an obstruction. —*Edmund R. Donoghue, M.D.*

Reconstructive Surgery of the Hand, with Special Reference to Skin Cover. STEWART H. HARRISON. *Brit. M. J.*, 1956, 2: 746.

THERE ARE two principles in reconstruction of the hand—the preservation of function and the preservation of tissue. The thumb and small finger, partly because of their position and partly because of the intrinsic musculature, can adapt well to imposed disabilities. These two digits are of prime importance to the damaged hand and should not be thoughtlessly sacrificed.

Maintenance of the functional position during immobilization is essential. Application of the dressing and bandage must be done with care to obtain compression and not constriction.

When dealing with amputated digits, minimal resection of bone and soft tissue should be the treatment of choice. The raw surfaces may then be covered by skin grafts or flaps.

There are several methods by which skin coverage can be accomplished. The free graft (split or full thickness), in most instances, provides adequate coverage except in cases requiring the transference of subcutaneous tissue. The survival of split grafts is more certain than those of full thickness and should be used over bone, nail beds, and in other instances of doubtful blood supply.

The thenar skin often serves as a donor site for fingertip coverage. However, skin from the palm of the hand, which produces a painful donor site should not be used. Also, persons past middle age tend to have residual stiffness of the interphalangeal joints following the period of immobilization; the arthritic joint should not be mobilized in acute flexion; the short stubby hand does not lend itself well to the position necessary; and a thick, palmar skin is not suitable for transfer-

ence. When this method of skin transference is used, there are two points which should be kept in mind—the flexed fingers should point toward the tubercle of the navicular and not less than 50 per cent of the flap should be inserted to insure its blood supply.

The cross-arm flap gives a good skin cover, but immobilizes both arms for 2 to 3 weeks. Abdominal flaps are satisfactory for multiple fingertips or for the replacement of skin over the dorsum of the hand.

The injured thumb must be preserved at all cost because it is the most important of the digits. Skin loss can be replaced by any one of the previously mentioned procedures. The best results seem to follow the use of local flaps to cover the defect. This often can be obtained from an adjacent finger or better from the dorsum of the hand.

Cross-finger flaps provide excellent cover for areas with skin loss on the flexor surface of the middle and proximal phalanges. The donor site is the dorsum of an adjacent finger and this defect is then covered by a split thickness graft.

Degloving injuries of the hand are fairly frequent in industrial accidents. The decision to excise the flap or to replace it is not an easy one. Frequently, a flap may appear viable at the time of repair only to be lost by subsequent thrombosis of the blood vessels. If the flap is replaced and then inspected after 24 hours, it will have certainly declared its viability during the interim. If necrosis has taken place, the necrotic flap must be excised and adequate coverage applied to prevent the inevitable infection which develops beneath devitalized skin.

In the event that some length has been lost from the thumb, there are three commonly used methods for making up the difference: (1) the chapeau flap of Gillies; (2) the two pedicle and bond graft; and (3) pollicization.

Instances in which the thumb has been lost completely lend themselves best to pollicization. A hand with four fingers is a poor functional unit as compared to a hand with a thumb and three fingers. When all of the digits have been lost, a forceps type of mechanism can be constructed using bone grafts, skin flaps, and tendon grafts. A movable wrist joint is of prime importance for the proper function of this type of reconstruction. —*William B. Stromberg, Jr., M.D.*

High Atmospheric Pressure as an Aid to Cardiac Surgery. I. Boerema, J. A. Kroll, N. G. Meyne, E. Lokin, and Others. *Arch. chir. Neerl.*, 1956, 8: 193.

The problem of how to bring lesions of the heart under direct vision for operative repair has given rise to the techniques of by-passing the heart, and, secondly, to hypothermia. Following a temporary circulatory arrest, the central nervous system and the cardiac musculature are the most vulnerable organs of the body, and these techniques have helped in reducing the damage ocurring as a result of temporary circulatory arrest.

The authors favor hypothermia as the more acceptable method of reducing tissue damage, since by this method the metabolic processes in the body are reduced and the circulation can be arrested for some time. The authors reveal in detail the functions of the various organs affected by hypothermia, as well as the accompanying changes in chemical blood values. The physiology of the body at 30 degrees, as compared to 25 degrees, presents marked differences, and until a good appreciation of the physiology at low temperatures is possible, operations carried out at very low temperatures are fraught with danger. The loss of the harmony and the dissociation of normal life processes causes death to occur either during hypothermia or soon after the warming-up process. Both deaths should be considered as a direct result of hypothermia itself; in the first instance it is probably due to ventricular fibrillation, and in the latter, to shock. At temperatures below 26 degrees C. the dangers associated with hypothermia increase enormously. The authors recommend cooling to 27 degrees C. rapidly, and for this purpose the method employed is arteriovenous blood cooling. Blood cooling has the advantage that the whole body is cooled fairly evenly, both internally and externally. Surface cooling does not achieve this as efficiently, and since this type of blood cooling demands the use of heparin, fatal postoperative hemorrhages can and do occur. Therefore, surface cooling is more universally applied.

The achievement of a complete cardiac arrest followed by a safe revival is the ultimate goal for safe intracardiac surgery. At 27 degrees C., the time available for circulatory arrest in the large blood vessels still is no longer than 6 to 8 minutes. Even at 19 degrees C. the circulation cannot be arrested for more than 12 minutes. The effect of increased atmospheric pressure on animals has been a subject of investigation and experiment for more than a century. Its influence on all organs, especially the heart, has been studied in full detail.

The authors have now carried out operative procedures inside a high pressure caisson in which the atmosphere was raised to 3 atmospheres absolute. The animals were intubated and ventilated with pure oxygen while the pressure was being raised, and consequently they were saturated with oxygen. Thus, by saturating the whole body with oxygen during the cooling process, the tissues function at a much slower pace and use up the oxygen reserve at a very slow rate. The authors believe that working at a pressure of 3 atmospheres absolute is quite safe. In their experiments no damage to the brain or heart was observed, nor was there an increase in the excitability of the myocardium.

The inflow of blood to the heart was stopped by ligating both venae cavae of the experimental animals, and there has been a total stoppage of circulation in the brain even for 45 minutes, with complete recovery in the animals operated upon under increased atmospheric pressure. Clamping both venae cavae does not cause a total arrest of the circulation through the heart, and as long as some pressure exists in the aorta, some circulation will remain.

The authors believe that it may be possible to provide an adequate circulation and oxygenation of the heart muscle, even if the total blood volume of an individual were to be replaced by a clear fluid, such as plasma, provided ventilation with oxygen at 3 atmospheres absolute was applied. If this were possible, then clamping of the in-flow and out-flow of the heart, a by-pass, or an oxygenator would no longer

be necessary. The heart could be opened under a clear fluid and operated upon through it, while avoiding the dangers of anoxia and air embolism. The authors believe that operating under conditions of increased pressure will prove an aid to expanding the possibilities of heart surgery. —*James H. Holman, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Radiodermatitis of the Neck (Radiodermitis del cuello). HECTOR MARINO. *Bol. Soc. cir. B. Aires*, 1956, 40: 657.

FOURTEEN PATIENTS were operated upon for radiodermatitis of the neck resulting from the treatment of benign thyroid disease (2 cases), of malignant thyroid disease (2 cases), of tuberculous adenopathy (2 cases), of cancerous adenopathy (1 case), of cancer of the larynx (4 cases), and of hypertrichiasis (3 cases). In 10 cases pedicled flaps were used; in 4 free grafts. The results were excellent and are shown in photographs.

The lesions were classified as radiodermatitis, radiodystrophy and radionecrosis. Radiodermatitis, the mildest of the injuries caused by radiation, is seldom more severe than a second degree burn and the skin will usually return to normal, perhaps with some hyperpigmentation. Occasionally the lesion will result in destruction of tissue and healing by cicatrization.

For the more severe forms of radiodystrophy, in which there is the hazard of malignant change, surgery is usually advisable. Excision of the lesion should be carried into the neighboring tissues as far as there is involvement of the blood vessels. As in severe forms of radionecrosis, the pedicled flap is preferred because the edges of the involved area are not normal and do not provide adequate nutrition for a free graft.

The deeper tissues involved should also be thoroughly excised. If the sclerotic connective tissue is too closely attached to the great vessels and nerves of the neck excision may necessarily be incomplete. In such cases the pedicled flap with its own blood supply has a definite advantage.

A pedicled flap advanced from the neck more posteriorly and from the shoulder region forms the most suitable flap. Next best is a pedicled flap from the pectoral region. The forearm and tubular flaps from more distant regions may sometimes be utilized.

The author warns against indiscriminate use of radiation therapy for lesions or conditions which could be treated otherwise. Radiation therapy should not be given by inexperienced and careless operators.

John W. Brennan, M.D.

ANESTHESIA

Anesthesiology as It Pertains to Radiology (L'anesthésie en radiologie). A. DAURI, F. DINALE, and G. MUNILLI-SOLARI. *Cah. anesth.*, 1956, 3: 601, 721.

THE AUTHORS review the radiologic techniques which often require the assistance of an anesthesiologist. An outline of the problems which are often encountered, with recommendations as to their management, is presented, and personal experiences with cardiac catheterization, angiocardiography, translumbar aortography, bronchography, cerebral angiography, encephalography, and ventriculography are discussed.

In cardiac catheterization, two general problems must be resolved. One hinges on the age and cardiac abnormality of the patient, and the other on the necessity of not altering the intracardiac pressures and oxygen tensions of the patients. The latter would render the information obtained by cardiac catheterization unreliable. The ideal anesthesia would be one which most closely approached physiologic sleep, such as obtained by intrarectal administration of avertin and intramuscular administration of atropine. The use of volatile agents and gases would, of course, be precluded. The intravenous or rectal administration of pentothal may also be used to maintain anesthesia, the rectal route being preferred. In order to keep the general anesthesia to a minimum, intravenous administration of meperdine and local administration of procaine are employed while the cut-down is being done. In this way interference with oxygenation is kept to a minimum. To diminish cardiac irritability, from 200 to 500 mgm. of "procamide" are introduced into the heart with a catheter. Angiocardiography also usually requires general anesthesia when done in children or unco-operative adults. The effect of the radiopaque material must then be considered. Tachycardia and transitory hypotension may appear. It is thought by some, and the authors favor this view, that controlled anesthesia in all patients undergoing angiocardiography would decrease the number of fatal complications. It is also convenient to follow cardiac catheterization with an angiocardiogram. In such situations a gas mixture with curare may be used. In the event that a second injection of dye is necessary, it is recommended that 30 minutes of light anesthesia be allowed for before the procedure is repeated. Translumbar aortography presents the added problem of having the patient in the prone position. Otherwise this procedure is done in the same manner as the previous one.

Bronchography is accomplished by placing a radiopaque iodide in the trachea by the supraglottic, transglottic, subglottic or intercricothyroid, or transthoracic route. The transglottic route is by far the most commonly used. Local pharyngolaryngeal anesthesia by insufflation or local application is usually most adequate. General anesthesia has also been employed and is of definite value in children and uncooperative adults; in these cases the intravenous administration of pentothal and succinylcholine with endotracheal intubation has been employed successfully. Cerebral angiography, as other forms of angiographic techniques, may be done under local or general anesthesia, the latter being preferred as the technique is difficult for the patient to bear and the study may be valueless if the subject does not cooperate fully. Encephalography and ventriculography require essentially the same anesthetic management.

—*J. C. Rosenberg, M.D.*

Anesthesia in Patients with Anthracosilicosis (L'anesthésie chez les anthracosilicotiques). R. BERNIS. *Acta anesthesiol. belg.*, 1956, 7: 57.

THIS ARTICLE is a review of the pathologic anatomy and physiology of anthracosilicosis, with particular emphasis on the problems which this disease presents to the anesthesiologist. In addition, the author pre-

sents a clinical study of patients with anthracosilicosis undergoing anesthesia. He compares various techniques in this group with a similar group not having this pulmonary disease and recommends a mode of management which he has found to be most satisfactory.

Anthracosilicosis is silicosis modified and aggravated by the inhalation of large quantities of carbon particles which produce obstruction of the alveolar ducts and lymphatic vessels. The silicosis produces progressive pulmonary fibrosis and is due to the inhalation of silicon dioxide. The characteristic lesion of anthracosilicosis is the "coal nodule" located around the terminal bronchioles. It consists of a fibrous reaction surrounded by a zone of reactive emphysema to which Gough has given the name "perifocal emphysema." Roentgenologically, the disease is classified, on the basis of the fibrous reaction, into the granular (or micronodular), nodular, and pseudotumor stages. On the basis of the emphysema, three further subdivisions may be delineated; the perifocal, hypertrophic, and bulous emphysematous types. It has been shown that as a result of the reduced functioning pulmonary parenchyma, a chronic hypoxia and carbon dioxide retention exist. An infectious process which would further decrease the volume of effective pulmonary tissue would naturally be of grave consequence in this situation. Furthermore, the carbon particles also are deposited in the walls of the pulmonary vessels, resulting in a fibroblastic proliferation and vascular obstruction. This is most noticeable in the later stages of the disease. Chronic corpulmonale is also a common complication in patients with anthracosilicosis. As a result of hypoxemia and chronic fatigue, and perhaps the toxic effect of silicon, an adrenocortical insufficiency, as reflected by the Thron test and diminished 17-ketosteroids, is present.

In an attempt to evaluate three different kinds of anesthesia, 127 miners and 365 nonminers undergoing gastrectomy were compared. The three techniques were spinal anesthesia with a hypobaric solution of procaine as outlined by Jones-Sebrechts; general anesthesia with pentothal, d-tubocurarine, and nitrous oxide with oxygen by endotracheal intubation; and general anesthesia with diparcol (diethazine or RP2987) and dolosal (meperdine or demerol). The latter was administered according to a special technique which the authors developed and which they believe gave the best results with fewest complications.

J. C. Rosenberg, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Progress in Surgical X-Ray Diagnosis by Use of the Picture Intensifier (Fortschritte in der chirurgischen Roentgendiagnostik durch Verwendung des Bildverstaerkers). W. SCHÜTZ and W. FROMMHOLD. *Chirurg*, 1956, 27: 337.

THE USE of fluoroscopy during operations involves the danger of radiation damage to the surgeon, the radiologist, and the patient. The surgeon does not want to prolong the operation and time of anesthesia unduly, and often uses the fluoroscope with insufficient adaptation of his vision. Therefore, in order to produce a bright and clear picture on the screen dangerously strong currents are used. Furthermore, the preservation of asepsis during surgery makes the wearing of protective clothing difficult or impossible.

To avoid these risks a new instrument called a "Bildverstaerker" (picture intensifier) was devised. In this apparatus the fluorescent layer used in the fluoroscope is applied on a slightly curved plate of aluminum. This layer is covered by a photoelectric metallic material. The fluorescent light of the screen is for the greatest part absorbed in this layer and leads to the emission of a number of electrons which is proportional to the light density of the picture. Between the photoelectric layer, which acts as cathode and anode, the photoelectrons are accelerated by a potential of 25 kilovolts. An electrostatic combination of lenses leads to the production of a picture on the anode side. This picture is reduced in size but correspondingly brighter. This instrument intensifies the picture from 800 to 1,000 times.

This instrument guarantees the optimal utilization of the x-rays. While in the usual fluoroscope only about 1 per cent of the rays absorbed by the screen serve in the production of the picture, in the intensifier the entire quantity of rays are utilized. Therefore, the total amount of radiation can be markedly reduced. Furthermore, because of the enormous increase in brightness, the time-consuming adaptation of the eye is almost completely obviated.

This instrument has proved most useful in the reduction of fractures and for continuous control in nailing fractures of the femoral neck. The duration of anesthesia is markedly shortened as no time is lost by developing x-ray films. The method has the additional advantage of giving continuous control, not only a single picture. —*Werner M. Solmitz, M.D.*

Malignant Lymphoma of the Gastrointestinal Tract; Roentgenologic Considerations. C. C. WANG and JAMES A. PETERSEN. *Acta radiol.*, Stockh., 1956, 46: 523.

THE AUTHORS present a review of the roentgenograms of 165 patients seen at the Massachusetts General Hospital in the past 20 years in whom lymphomatous involvement of the gastrointestinal tract has been proved histologically by operation or a postmortem examination. They make use of the term "localized lymphoma" and "general lymphoma" and note that 89 of the tumors were considered to have arisen primarily in the gastrointestinal tract without evidence of involvement elsewhere, while the remainder were considered as a part of the general process. Of the group, roentgenograms were available in 66 cases and are divided as follows: esophagus, 4; gastric, 48; small bowel, 12; and large bowel, 2.

Esophageal lymphoma occurred in 9 patients (5 per cent), with the roentgenograms of 2 patients indicating localization to the esophagus or periesophageal tissues, whereas 2 other cases were part of a generalized disease. Both filling defects and ulceration were noted.

In gastric lymphoma, the most common site of involvement, the findings are: (1) giant rugal folds; (2) extensive involvement but little impairment of peristalsis; (3) multiple gastric ulcers; and (4) the presence of a large gastric ulcer and a palpable tumor mass in a young patient. In this group of 82 patients (50 per cent), the growths in 57 were considered localized and in 25 generalized.

Lymphomas of the small bowel have been recognized with increased frequency in recent years. Of 59 of the cases (36 per cent) in this series, the tumors were localized in 26 and generalized in 33 patients. These presented multiple ulcerating lesions, large soft tissue masses, nodular lesions, and a "deficiency pattern."

Lymphoma of the large bowel, though rare, was present in 15 cases (9 per cent). In the 2 available for study with roentgenograms, 1 presented a smooth filling defect (tumor) and the second an annular lesion located in the ascending colon.

In the authors' discussion and differential diagnosis, it is indicated that an absolute diagnosis of lymphoma is rarely made in the differential diagnosis and must await operative confirmation.

The roentgenograms illustrating esophageal, gastric, and small bowel lesions are excellent.

—*Moris Horwitz, M.D.*

Spontaneous Regression of Polyps of the Colon in Children. LARS ANDRÉN and STURE FRIEBERG. *Acta radiol.*, Stockh., 1956, 46: 507.

THE AUTHORS indicate that the presence of polyps of the colon in children is not uncommon and that there is a definite change in the frequency of their occurrence with the preponderance being present in the 4 to 6 year age group. Past this age the rate of occurrence decreases in frequency and then again increases in adult life between the ages of 20 and 30. Reference is made to the work of Kennedy in children and to the work of Scarborough in adults.

The authors describe 2 cases in which there was definite regression of polyps of the colon as indicated by proctoscopic and roentgenologic control. They also indicate the advisability of the double contrast study for visualization of polyps of the colon in children, as well as in adults. The cause of the spontaneous regression of the colon polyps is unknown.

The authors indicate that surgical intervention may be unnecessary for the management of colon polyps in

children, particularly when they are above the reach of the sigmoidoscope, since the incidents of malignant changes in polyps of the colon in children is exceedingly low. They do indicate, however, that those lying within the reach of the sigmoidoscope should be removed.

Four roentgenograms are reproduced which adequately demonstrate the spontaneous regression of the colon polyps in children. —*Moris Horwitz, M.D.*

Calcification of the Renal Fossa in Cystic Formations and in Tumors (Le calcificazioni della loggia renale nelle formazioni cistiche e nei tumori). LUIGI RONCORONI. *Radiol. med.*, Milano, 1956, 42: 953.

EIGHT INSTANCES of renal and perirenal calcification are reported. Included are 2 cases of calcified congenital renal cysts, 1 case of echinococcus cyst, 3 cases of so-called sponge kidney, and 2 of renal carcinoma.

The first case was that of a 19 year old male who at birth presented a mass in the right hypochondrium. This mass slowly increased in size. The urine had at times assumed a sanguineous color and recently the patient complained of pain in the right side of the abdomen. The roentgenogram disclosed an orange-sized, cystlike shadow, bordered by shadows of calcification, in the region of the right kidney. No urine was discharged from the right ureter. Operation disclosed a large cyst with semisolid contents. There was no evidence of kidney tissue. The proximal portion of the ureter was blocked by fibrous tissue. The diagnosis was calcified congenital cyst of the right kidney.

The second case was that of a 67 year old male who had been suffering from stomach pains for some months. The roentgenographic findings were much like those in the first case, except that the entire cyst, together with its contents, was more or less completely calcified and the cyst occupied only the upper half of the right kidney. Urographically the kidney showed normal elimination. The diagnosis in this instance also was calcified congenital cyst of the right kidney. Since the mass had never caused any serious symptoms operation was not done.

The third case was that of a 34 year old male who some months previously had suffered pain in the left lumbar region and hematuria of 3 days' duration. Recently there had been pain in both lumbar regions with high fever.

Roentgenography revealed numerous, pinhead-sized shadows in both kidney regions. In the lower half of the left kidney the shadows were grouped into more or less solid masses. Urographic examination showed the typically enlarged pyramids and calyces of the sponge-kidney. Under pressure the surrounding halos of urine indicated that the calcifications were lying within dilated excretory ducts of the renal pyramids. Forty minutes after removal of the compression the halos were still present (urinary stagnation).

The fourth and fifth cases were sufficiently similar roentgenologically to permit omission of detailed description. The fourth case was that of a 49 year old female with a history of pain in the right hypochondrium at intervals for several years and an attack, 2 years previously, of left renal colic. Ten days previously the patient had discharged numerous small calculi. The fifth case was that of a 30 year old male who complained of violent pain in the left flank 4 days previously. The pain had continued and extended along the left ureter to the testis. The urine contained a trace of albumin and a few desquamated cells, leucocytes, and red cells. There was also duplication of the renal pelvis and partial duplication of the right ureter.

The sixth case was that of a 58 year old male who complained of vague pains in the right hypochondrium. Roentgenologic examination revealed the presence of a large kidney-shaped mass with calcified walls in the region of left kidney. The disposition of the shadows gave the appearance of marmoration, such as is observed in echinococcus cysts which have been inert for a long time. The patient was not operated upon.

The seventh case was that of a 56 year old male who, a few months previously, had developed pain in the left lumbar region. The pain was constant and radiated down the left thigh. After a few days it was replaced by a sense of heaviness. Roentgenologic examination disclosed numerous calcareous shadows, arranged in striae, within a large tumor mass in the left abdominal cavity. Intravenous urography showed compression of the upper calyces of the kidney above the tumor. The middle and lower calyces had entirely disappeared. The tumor and left kidney were removed. The histologic diagnosis was carcinoma with extensive calcification.

The eighth case was that of a 52 year old male who complained of cramp-like epigastric pain, cough with moderate expectoration and progressive dyspnea. Roentgenologic examination disclosed dime-sized shadows in the lungs and a large mass in the region of the left kidney, which occupied the upper pole and displaced the renal pelvis and calyces downward. The tumor mass showed many fine calcareous shadows. A malignant condition was suspected but because of the pulmonary shadows which suggested metastases operation was not attempted.

—*John W. Brennan, M.D.*

Arterial Supply to the Head of the Femur; an Arteriographic Study in Vivo of Lesions Attending Fracture of the Femoral Neck. HERBERT MÜSSBICHLER. *Acta radiol.*, Stockh., 1956, 46: 533.

FROM A SURVEY of the literature, the author concludes that the lower and, particularly, the upper capsular branches of the medial circumflex artery are the most important sources of supply to the femoral head. The ligamentum teres artery, which may be absent or obliterated, plays a smaller part but may in some measure compensate for a disturbance of the circulation in the capsular vessels.

The author, prior to the in vivo studies, injected an opaque material (white lead pulp) into the distal portion of the medial circumflex artery (the "posterior collum" branch) of a number of specimens to demonstrate the gross vascular anatomy of the head of the femur.

In making the in vivo studies, the author injected 15 to 20 cubic centimeters of 50 per cent dijodone percutaneously into the femoral and deep femoral arteries (no difference in density) by passing a catheter proximally into the femoral artery for a distance of 18

centimeters (to study the vessels of the opposite hip for comparison). Four exposures were made in 5 to 6 seconds; the first was made during injection of the last 5 cubic centimeters of medium. A total of 28 diseased hips, including fractures, dislocations, aseptic necrosis, pseudoarthrosis, and carcinomatous metastases to the acetabulum, as well as 15 sound hips were studied.

Lesions of the posterior collum branch (supplying the capsular arteries) of the medial circumflex artery were of importance since they were not present in the sound hips. These took the form of (1) dilation, (2) decreased rate of flow, and (3) arrested circulation. These lesions are considered to be pathologic.

—*Moris Horwitz, M.D.*

The Primary Treatment of Adenocarcinoma of the Rectum by High Voltage Roentgen Rays (1,000 Kv.). I. G. WILLIAMS and H. HORWITZ. *Am. J. Roentg.*, 1956, 76: 919.

IN THE INTRODUCTION the authors state that in adenocarcinoma of the rectum, surgery (the abdominoperineal resection of Miles) undoubtedly offers the patient his best chance of cure and remains, therefore, the treatment of choice whenever it is technically feasible. Some less formidable operative procedures may be indicated under various circumstances, especially when conservation of the sphincter mechanism is desired. Among the nonsurgical procedures are listed: (1) diathermy fulguration, (2) contact roentgen therapy; (3) surface and interstitial radium therapy; (4) conventional deep roentgen therapy; (5) rotational therapy, and (6) supervoltage roentgen therapy and telecurie therapy.

The authors treated 189 patients between 1937 and 1954 at St. Bartholomew's Hospital, London, England, by using supervoltage roentgen therapy with 1,000 kilovolts. All of these patients had adenocarcinoma of the rectum and 82 per cent were inoperable, while in the remaining patients operation was contraindicated for one reason or another. The clinical classification of the extent of the disease is shown in Table I.

The treatment factors were: 1,000 kilovolts; half-value layer of 9.3 millimeters of copper; an anterior and posterior port with corresponding anterolateral and posterolateral ports, each of the order of 16 by 10 centimeters; a depth dose to the whole of the true pelvis of the order of 120 to 140 per cent of the skin field dose; a total tumor dose of 6,000 roentgens in 6 weeks, with irradiation being carried out 5 days per week.

TABLE I.—TOTAL NUMBER OF CASES—189

		Cases	*Per Cent*
Stage I	Lesion confined to rectal mucosa but not penetrating rectal wall	8	4
Stage II	Lesion involving whole thickness of rectal wall but not extending beyond these limits	26	14
Stage III	Lesion spread beyond rectum to neighboring structures and/or involving regional lymph nodes in the pelvis	128	68
Stage IV	Carcinoma of the rectum with distant metastases	27	14

TABLE II.—RESULTS OF IRRADIATION

	Present	*Completely relieved (Per cent)*	*Partially relieved (Per cent)*	*Not relieved (Per cent)*
Pain	102 cases	49 (48)	29 (29)	24 (23)
Tenesmus	66 cases	36 (55)	12 (18)	18 (27)
Mucous discharge	116 cases	47 (41)	30 (26)	39 (33)
Bleeding	135 cases	103 (76)	18 (14)	14 (10)

TABLE III.—SURVIVAL RATES

	Total	*2 year survivals (Per cent)*	*3 year survivals (Per cent)*	*5 year survivals (Per cent)*
Stage I	5	2 (40)		
Stage II	21	10 (48)	4 (19)	2 (10)
Stage III	115	40 (35)	17 (15)	7 (6)
Stage IV	24	3 (12)	2 (8)	
Total	165	55 (33)	23 (14)	9 (5)

The greatest benefit that resulted from this form of irradiation was the complete or partial relief from symptoms due to the primary growth. This is shown statistically in Table II.

Next came the avoidance of colostomy. This was accomplished in 41 per cent of the cases. In the remaining 59 per cent colostomy was performed (a) either before or after treatment to relieve obstruction, (b) as part of a radical operation for removal of residual or recurrent carcinoma after a full course of supervoltage roentgen therapy and, (c) for postradiation fibrosis.

The survival rates were studied in 165 patients who were treated between 1937 and 1949. The figures obtained are compiled in Table III.

Another important benefit which can be ascribed to the type of irradiation produced by the supervoltage roentgen rays, when compared to the conventional deep roentgen rays, is the greatly reduced incidence of early and late radiation reactions. This is not due to any biologic effect, but to the increase in the depth dose obtained and to a greater facility of technical application.

—*T. Leucutia, M.D.*

The Treatment of Malignant Melanoma with Special Reference to the Possible Effect of Radiotherapy. LORENTZ NITTER. *Acta radiol.*, Stockh., 1956, 46: 547.

THE PRELIMINARY review of the literature indicates the wide difference of opinion that exists between surgeons and some radiotherapists regarding the therapeutic approach to malignant melanoma. Reference is made to the improved results obtained with more radical surgery which includes broad excision of the primary tumor and underlying fascia, together with regional prophylactic dissection of the glands in one or more regions. On the other hand, some radiotherapists claim that these tumors are more or less radiosensitive and that many cases can be treated advan-

tageously by roentgen or radium therapy. Emphasis is placed on a number of instances in which the primary tumor proved to be surprisingly radiosensitive. A third group suggests that better results might be obtained by a combination of surgery and radiotherapy.

Because of the varying time intervals before patients seek help, preliminary removal of the tumor, selection of cases, recurrence of the tumor, and metastases, it is difficult to accurately assess the value of various surgical techniques or radiotherapy. While many lesions are quite characteristic clinically, many are atypical and only a histologic diagnosis is absolute.

The following (Pack) factors are stressed: (1) The value of immediate treatment; 1 month's delay after the microscopic diagnosis has been made reduces the percentage of "cures" from about 40 to 17 per cent. (2) Among the patients in whom gland dissection was performed with negative microscopic findings the "cure" rate was 14.1 per cent. (3) The careful examination of clinically negative lymph gland material revealed tumor cells in 50 per cent of the cases, pointing to the necessity of prophylactic gland dissection.

A review of the figures of the Norwegian Cancer Registry indicate the incidence of malignant melanoma to be about 10 per cent of the primary malignant tumors of the skin. The author reviews the material on 393 cases of malignant melanoma at the Norwegian Radium Hospital, Oslo, Norway. He discusses in detail 192 cases of patients who survived more than 5 years. The treatment had consisted of surgery combined with radiotherapy, often with postoperative radium molds on the scar region after primary excision. In some cases prophylactic gland irradiation seems to give a better prognosis. The author concludes that postoperative radiotherapy cannot be disregarded for this tumor form. The good results seem to equal those from purely radical surgery.

A classification made according to stages is included, as well as 9 tables indicating the influence of staging, localization, primary treatment, effect of prophylactic gland irradiation, age, sex, and the prognosis as to site.

—*Moris Horwitz, M.D.*

MISCELLANEOUS

Irradiation Therapy of Lymphosarcoma of the Base of the Tongue. Comments upon 22 Patients Treated by Irradiation Methods at the Curie Foundation in the Period from 1920 to 1948. (La radioterapia dei linfosarcomi della base della lingua; a proposito di 22 malati radiotrattati alla Fondation Curie dal 1920 al 1948). ANGELO CARIMATI. *Radiol. med.*, Milano, 1956, 42: 868.

THE 22 PATIENTS have a history of more than 5 years since conclusion of the treatment. Twenty of the 22 subjects received roentgen irradiation therapy; 2 received telecurietherapy. A third of the patients were women. There was one 5 year survival among the women and 6 among the 15 men. The number of the 5 year survivals decreased with the advance in age of the patients at the time that the therapy was first started.

In the circumscribed form on the base of the tongue the treatment resulted in apparent cure in one-half the cases; with invasion of the regional lymph nodes the apparent cures were reduced to a seventh. A further prognostic finding was the extent of the spread of the process.

The possibility of cure is greater in the patients without detectable adenopathy; the prognosis is not so good in those with unilateral adenopathy and worse in those with bilateral adenopathy. The most serious prognosis is in those instances in which there is supraclavicular and inferior carotid adenopathy.

Ten of the 22 patients treated died within the first 10 months after initiation of the treatment. Of the 7 previously mentioned 5 year cures (1 woman and 6 men), 2 died in the sixth year of generalized metastases and 2 died of intercurrent pathology after periods of 10 and 21 years. The remaining 5 year survivors are still alive and well, and without evidence of local or general metastasis after a minimum period of 10 and a maximum of 21 years.

The diagnosis in all these patients was based upon histologic examination of the tumor tissues.

—*John W. Brennan, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Restoration of the Face Covering by Means of Selected Skin in Regional Esthetic Units. M. González-Ulloa. *Brit. J. Plast. Surg.*, 1956, 9: 212.

The author believes that patches of skin applied to the face in an effort to correct a skin defect often lead to a result which is no better, or worse, than the original condition. He suggests that restoration should be accomplished by the replacement of complete regions (Fig. 1).

The skin of the face can be divided into regions having a definite thickness and histologic composition called "regional aesthetic units." Investigation, regarding both skin thickness and composition in infants, adults, and aged subjects, have been carried out, and comparable sites available as donor areas have been selected.

Restoration by complete regions has two distinct advantages; (1) to conceal the limits of the grafted area by normal skin folds or hair lines; and (2) to provide a covering of similar thickness and composition.

The grafts must be placed on a surgically fresh recipient site, and the edges of the defect are undermined to enable suturing without tension. Skin grafts are sutured in place with No. 5-0 dermalon, and the sutures are removed in 48 or 72 hours. The usual methods of preventing fresh grafts from slipping or losing contact with the recipient area are utilized.

—*M. C. Anderson M.D.*

Pilonidal Sinus; Preliminary Report on a Fresh Approach. Warner F. Bowers and Walter S. Williamson. *Arch. Surg.*, 1956, 73: 931.

Until recently at Brooke Army Hospital, the authors had been following the policy of incision and drainage of pilonidal abscesses, reserving an unroofing or marsupialization procedure for recurrent cases. Although the end results have been entirely acceptable, a procedure employing primary closure would seem to offer better healing in a shorter time, provided that the usual difficulties of hematoma formation, wound disruption, and recurring infection can be controlled. The authors have not been of the opinion that the bacteriologic problem was a primary one and, therefore, have placed no reliance on the local or general use of antibiotics or other drugs. They have not believed that the operative failures were recurrences of the cyst or sinus, but that they represented failures of good wound healing for a variety of reasons. The authors' effort, therefore, has been directed toward careful wound closure to avoid dead space and hematomas, the avoidance of suture material for hemostasis, and the use of wire sutures for accurate wound approximation, with removal when the wound is solid.

In the patient with a minimal acute infection, an elliptical excision is done, removing little skin and only enough tissue to remove completely all the lesion down to the fascia. The specimen is inspected and opened to be sure that no tract has been transected. Hemostasis is secured by the temporary use of a moist, warm gauze pack. A No. 28 wire suture is then introduced at the lower angle of the wound through normal skin and is placed as a running mattress stitch the length of the wound in the manner of a subcuticular stitch. This suture is placed at the level of the fascia and is brought out at the upper angle of the wound through normal skin. Three more such continuous mattress wire stitches are placed in layers from deep to superficial, the last one being subcuticular in position. These stitches are pulled tight as they are placed, great care being taken to see that there are no remaining dead spaces. The wires then are passed through a small piece of sponge rubber and a button. A lead shot is crimped onto the wires and a small dry dressing is placed.

Postoperatively, the authors allow the patient to assume any comfortable position, make no effort to inhibit bowel movements, allow the patient to be out of bed as soon as sutures are removed, and remove the wire sutures by the "pull-out" method after about 10 days if the wound looks clean and solid. Should there be some inflammatory reaction, there is no reason why the sutures cannot be left in place while this complication is managed by local application of heat. The authors have not used antibiotics either preoperatively or postoperatively.

Fig. 1 (González-Ulloa). The covering of the face divided in regions produces a map of "regional aesthetic units." These lines show the limits for transplantation whether with grafts or flaps.

This preliminary report seemed to be indicated because the first 6 cases completely justified the authors' original assumptions and expectations. The group is small but the clinical results have been uniformly good and the follow-up periods range downward from 6 months. The only complication has been a small area of pressure necrosis in each case at the points where the wires emerge through normal skin, but this has not been a significant difficulty and has not interfered with a solid healing of the wound. Each patient has been in the hospital about 1 month and has lost a total of about 6 weeks from duty.

This is a method of primary closure, avoiding all retained suture material in the wound and depending upon "pull-out" wire sutures placed in the long axis of the wound rather than transversely. These sutures can be left in place until wound healing has been completed even if infection supervenes postoperatively. The case group was tripled before publication of the paper with completely satisfactory results in about 18 cases with up to 18 months' follow-up.

The Aggressive Treatment of Metastases. EDWARD WILSON. *Med. J. Australia*, 1956, 43: 292.

RECENTLY large segments of the medical profession have changed from a passive and fatalistic acceptance of the ultimate prognosis in metastatic disease to aggressive treatment of such disease. New technical improvements have played a part in stimulating such a change in attitude.

Tests for the early detection of metastases are limited to such things as serum acid phosphatase estimation in carcinoma of the prostate and serum protein determination in multiple myeloma. The discovery of early metastases is therefore left to the acumen of the physician.

Once metastases have appeared, however, there are ways in which one can interfere with their growth. While hormone therapy is well established in a limited number of carcinomas at the present time, such therapy is limited to prophylactic and palliative treatment. The value of prophylactic hormone therapy is not well established as yet. Palliative hormone therapy, such as administration of testosterone to affect mammary carcinoma in the premenopausal patient or adrenalectomy, has found fields of definite usefulness. Cortisone and ACTH have found comparable usefulness in the treatment of leukemia and lymphoma.

Castration has been found to be useful in the treatment of carcinoma of the prostate and of the male breast. Likewise, oophorectomy has found a place in the palliation of advanced cases of carcinoma of the breast, either alone or in combination with adrenalectomy.

With the advent of cortisone, adrenalectomy for treatment of hormone-dependent tumors was revived. It had first been advocated by Huggins and Scott in 1945, but without cortisone it was not practical. This operation produced disappointing results in the treatment of carcinoma of the prostate and for these cases, medical adrenalectomy with high doses of cortisone to depress the functioning of the adrenal cortex is advocated.

Operative treatment of metastases may be extended in the future. Under such a heading, the second-look operation of Wangensteen must be included. This operation is not recommended for patients in whom lymph nodes have been negative at the first operation, although it may be considered for selected patients. It should be strongly considered for use in malignant disease with a relatively good prognosis, such as colonic, ovarian, and rectal carcinomas. On the other hand, it should not be forgotten even for those patients with carcinoma of the stomach. who have a relatively poorer prognosis.

At the present time, it is doubtful whether the radical resection of a carcinoma of the head of the pancreas is ever indicated.

The place of supraradical surgery is not yet clearly established. If the considerations of the patient's condition, the site of malignancy, the tissues involved, and the patient's subsequent invalidity are considered, some supraradical operations may be justified. It is by the experimental use of such procedures and by a later analysis of the results that evaluation of their usefulness will be possible.

The elective removal of pulmonary metastases which appear to be single is based upon a forlorn hope that there is no metastasis elsewhere. The discovery and removal of solitary hepatic metastases years after the primary operation have been reported. The technique of hepatic resection has been simplified by the ligation of appropriate branches of the portal vein, hepatic artery, and bile duct.

When multiple viscera are involved by a tumor, the enterprising surgeon may give the patient more of a chance by undertaking a multiple visceral resection. The importance of avoiding a fatalistic attitude is emphasized.

While pelvic evisceration may be performed for the treatment of a pelvic carcinoma, it may also be used for treating the sequellae of radiation therapy; it is often used as palliative treatment.

—John J. Bergan, M.D.